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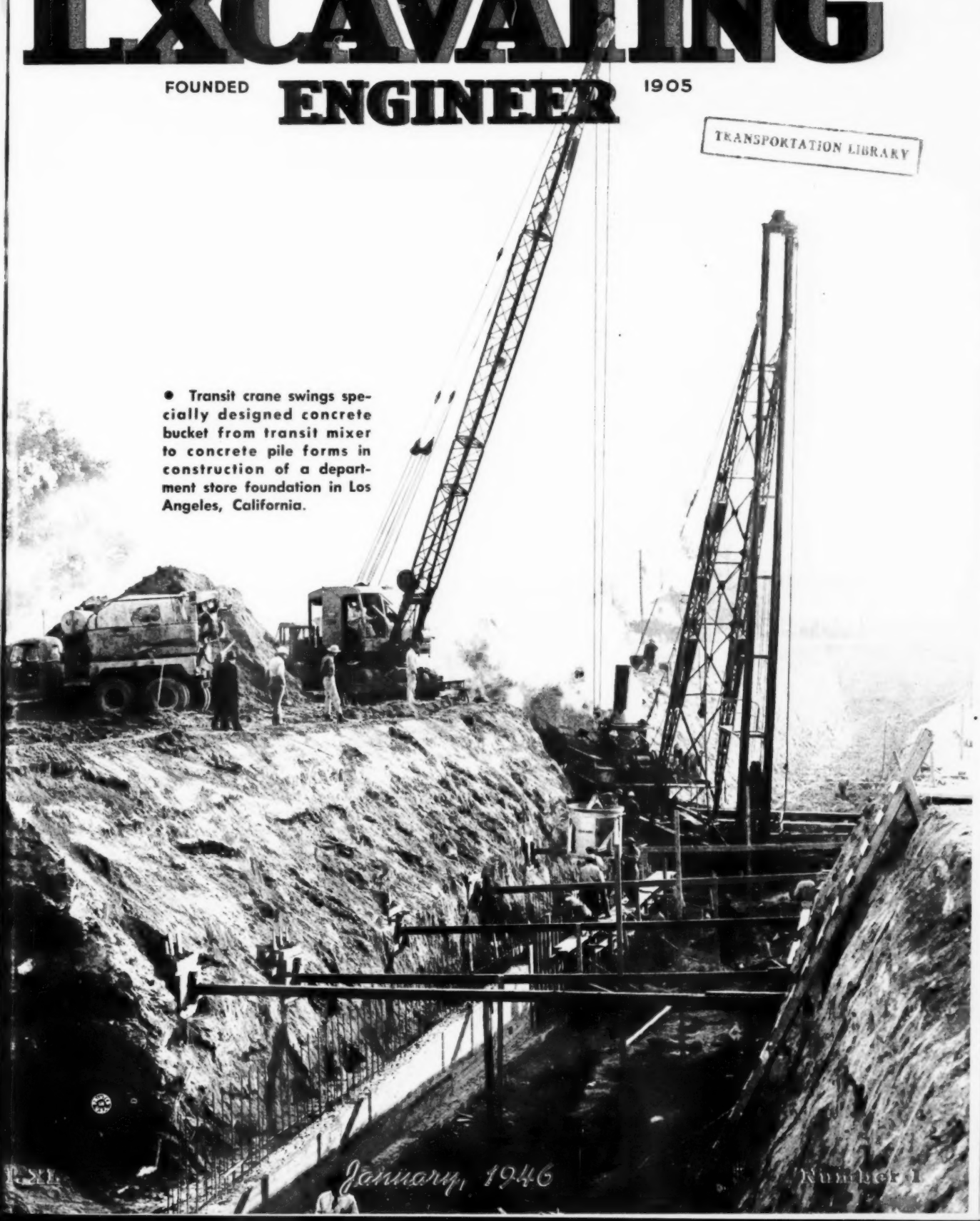
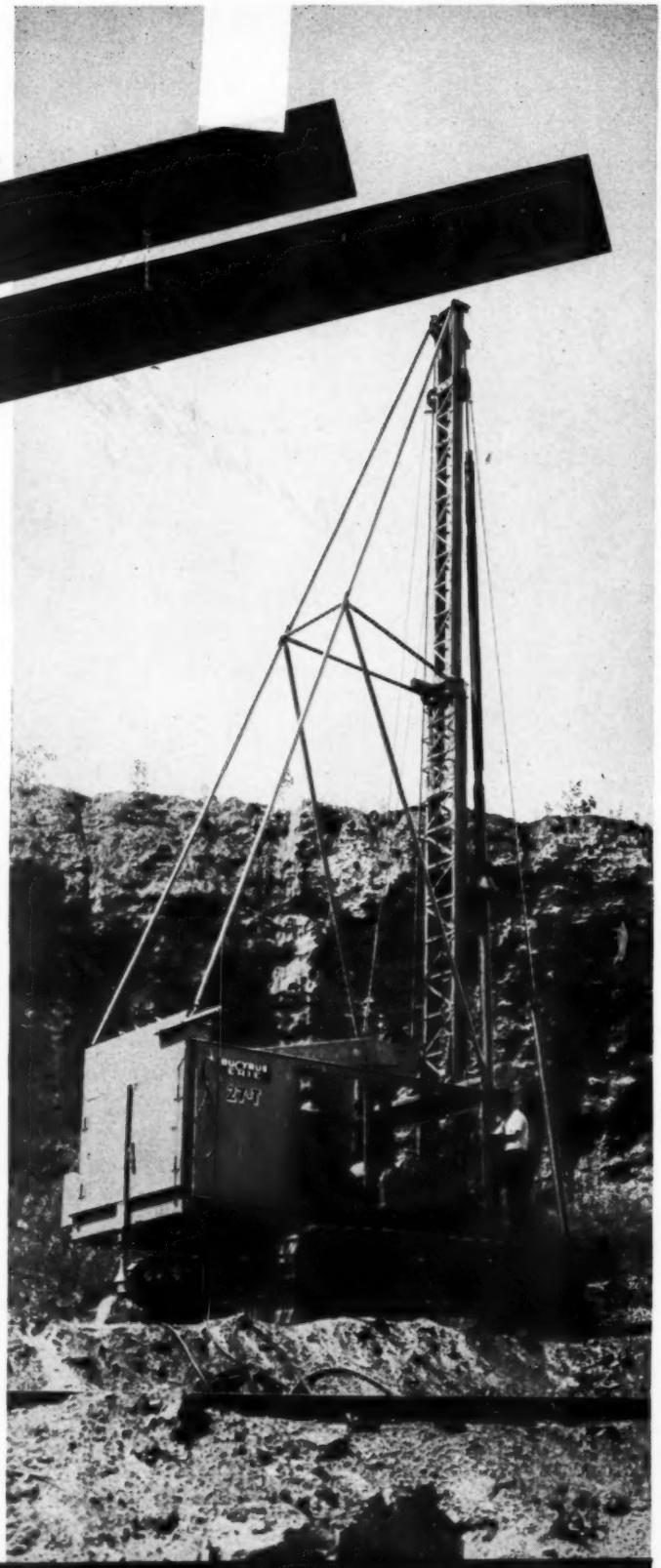


• Transit crane swings specially designed concrete bucket from transit mixer to concrete pile forms in construction of a department store foundation in Los Angeles, California.

January, 1946 Number 1

300



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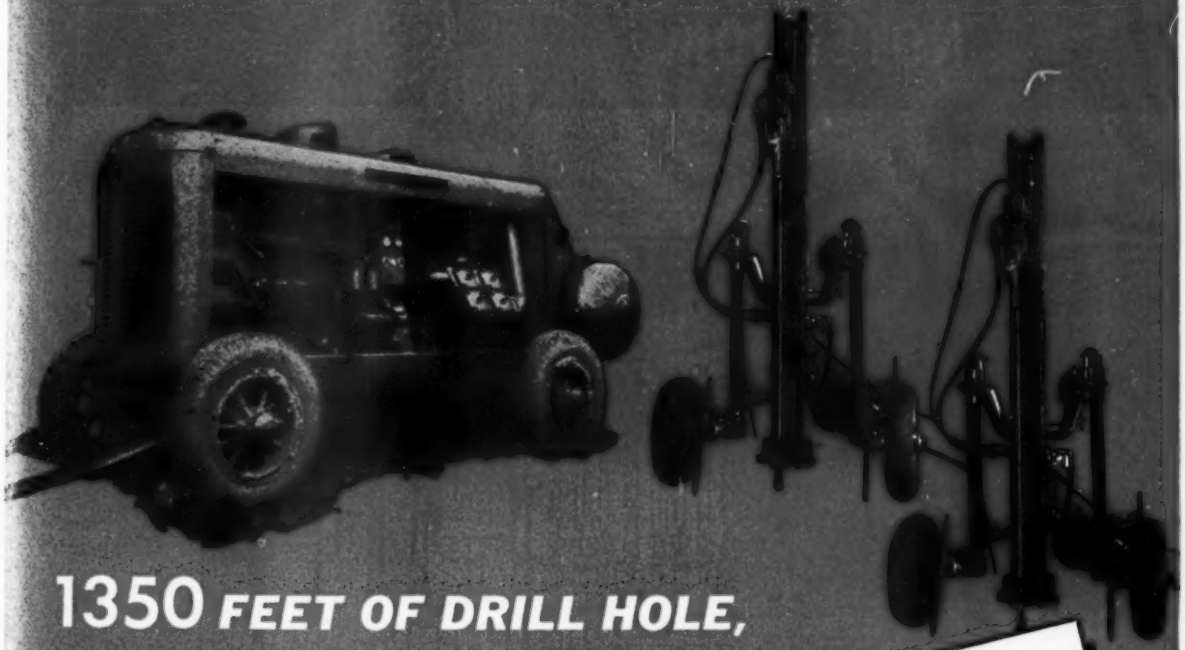

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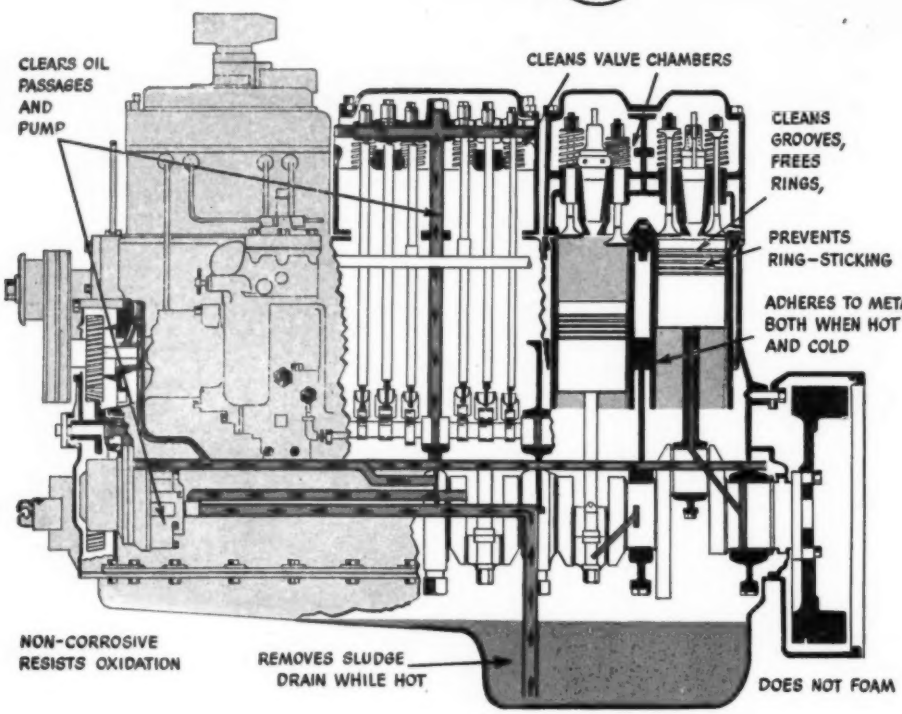
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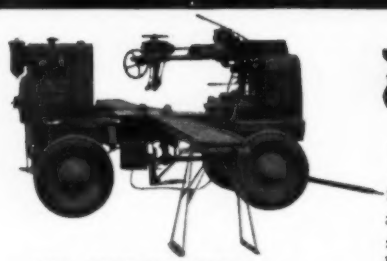

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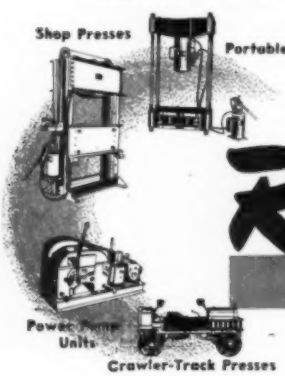
Your dealer probably has Rodgers Track Servicing Presses in his service department for the purpose of helping you maintain your equipment. If he hasn't and your requirements won't justify your having a Rodgers Press of your own, urge him to investigate the savings of a Rodgers. It will pay you both!



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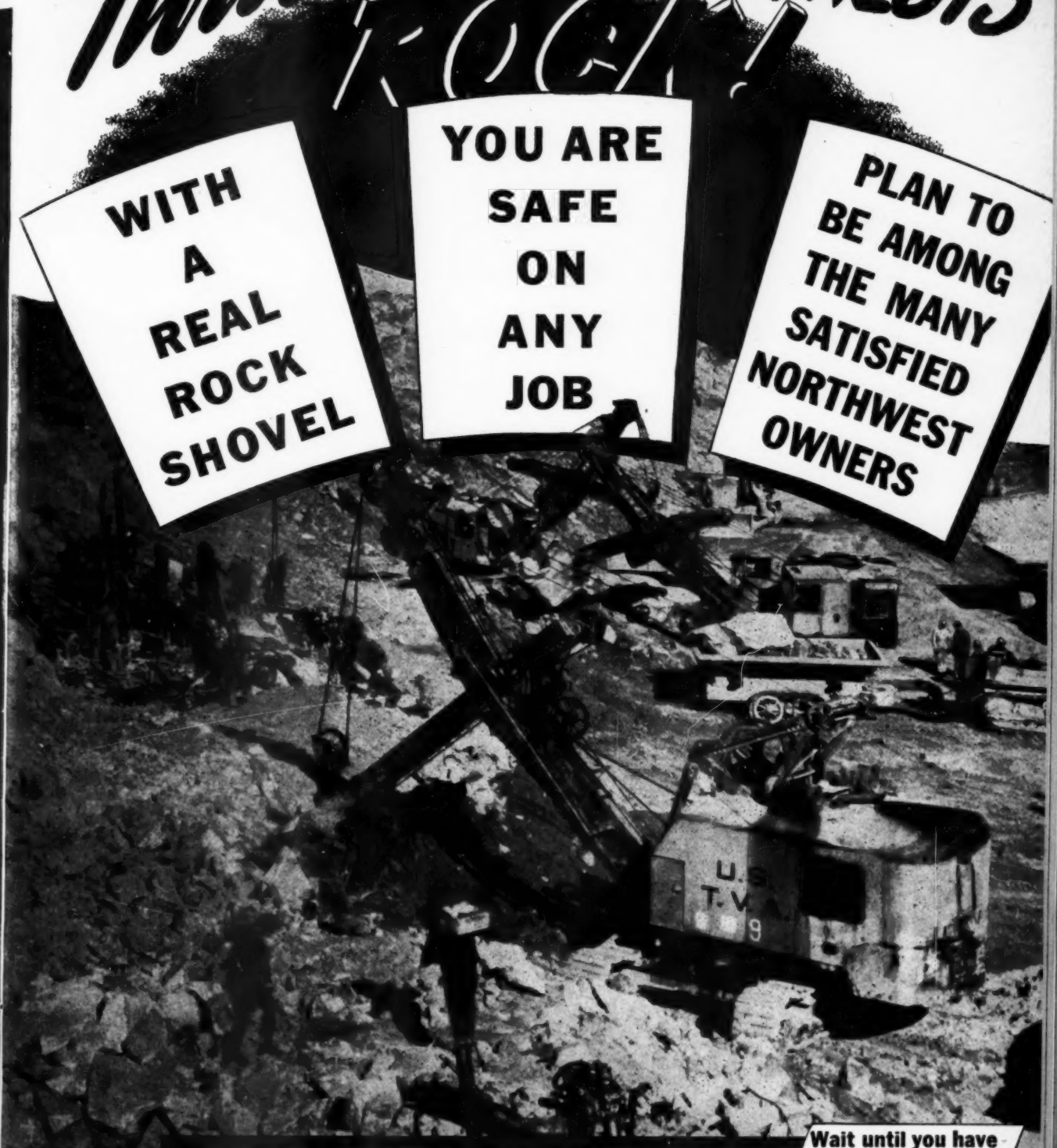

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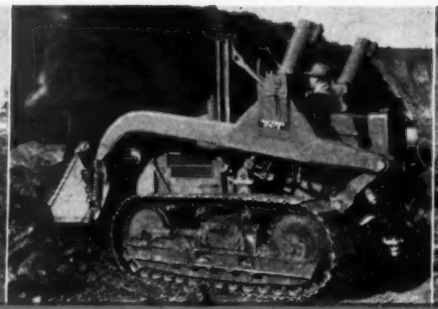

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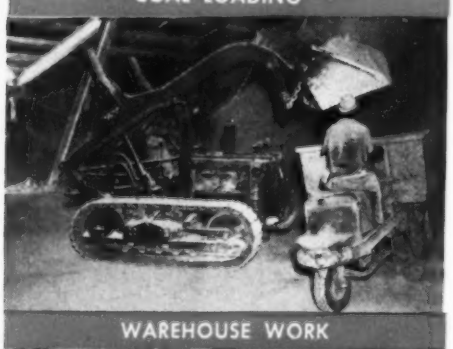

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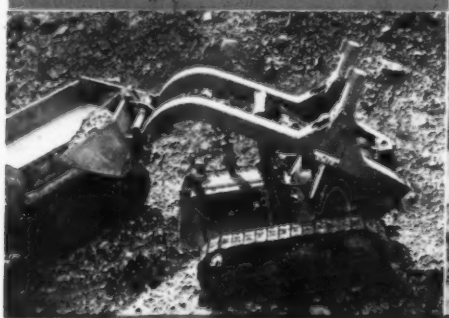
CULM RECLAMATION



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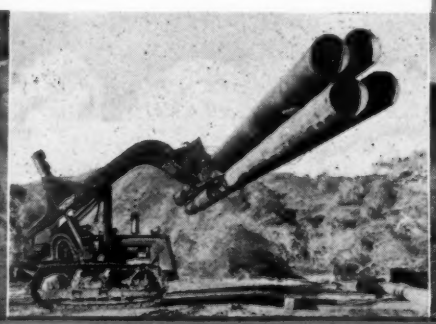

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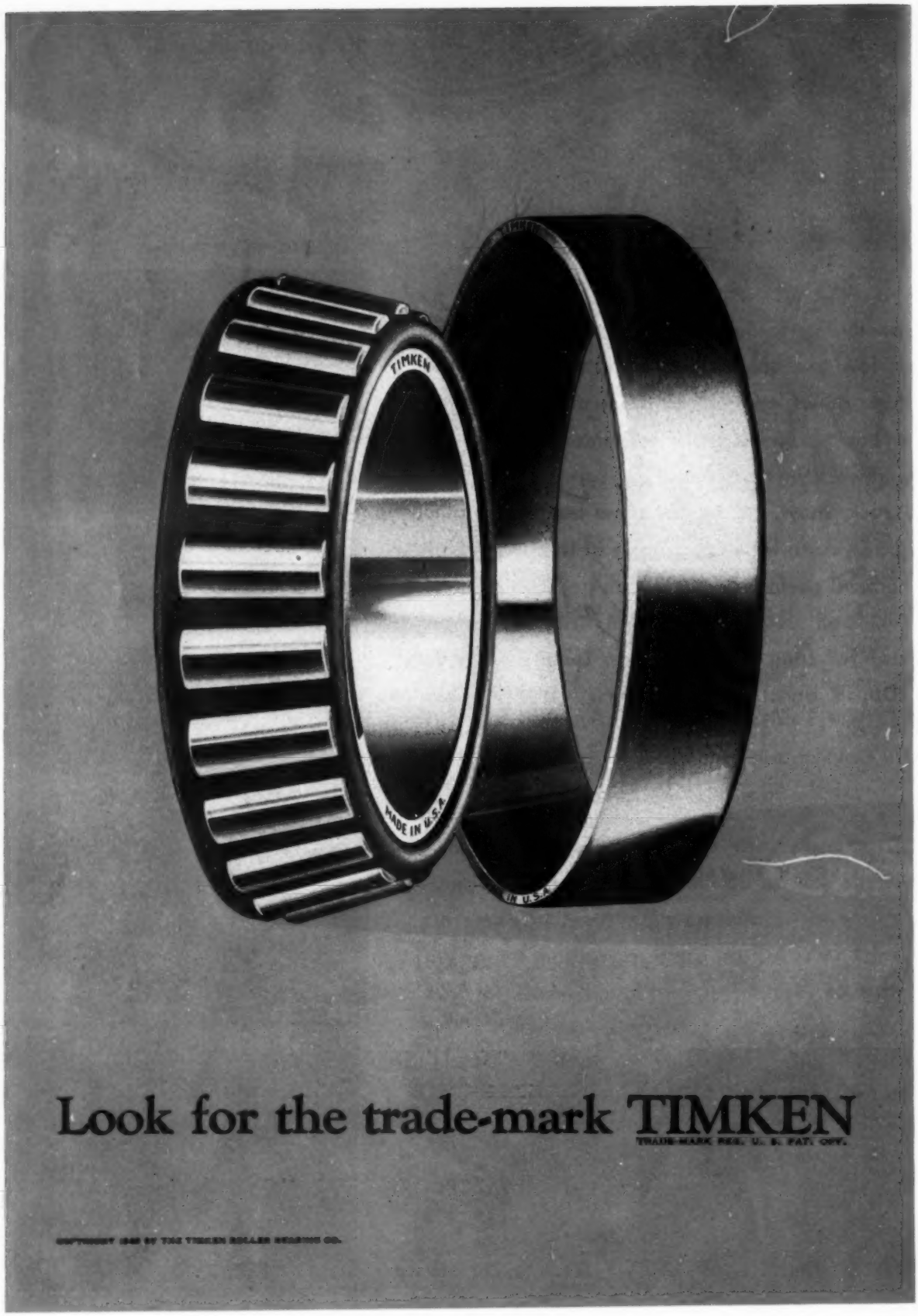

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LIKE A CHAMPION SKATER

FORM-SET ROPE IS *relaxed*

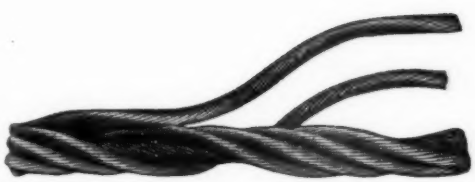
Ever watch a truly great skater? Ever watch him rocket down the straightaways, glide around the turns? He's graceful, swift, sure . . . a study in balance and smooth endurance . . . because he's *relaxed.*

You'll find much of that same relaxed quality in Bethlehem Form-Set rope. Form-Set rope is preformed; each wire and each strand is molded to its final helical shape before being laid in the rope. In this way many internal stresses and strains are relieved. Since the wires and strands are preshaped into their final form, they have no nervous urge to straighten themselves out. They do not fight to uncoil. The rope is *relaxed.*

Cut a section of Form-Set rope. You'll notice that not a single wire or strand pops loose from the rope. They all lie smoothly in place. To get them apart, you actually have to lift them out with your fingers.

What is the advantage of this *relaxation*? Clearly, it means easier handling. But more important still, it promotes *longer life* on jobs where bending fatigue is a serious item—and this includes practically all operating ropes.

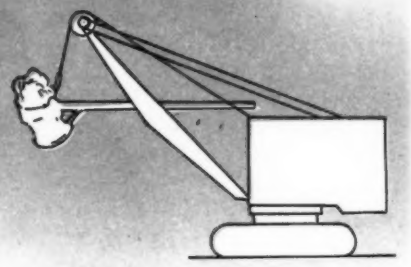
Bethlehem furnishes every grade, size, and type with the Form-Set construction . . . the feature that *relaxes* wire rope.



Why a Form-Set (preformed) rope is relaxed. Preforming "sets" the wires and strands in their helical permanent shape, so that they have no tendency to fly apart, even when cut or broken.

When you think WIRE ROPE . . . think BETHLEHEM

Shovel Practices



Hints on efficient operation of a power shovel to give peak performance without exceeding the limit of endurance.

By LEE DU BOIS

(Bucyrus-Erie Co., Service Engineer, Seattle, Wash.)

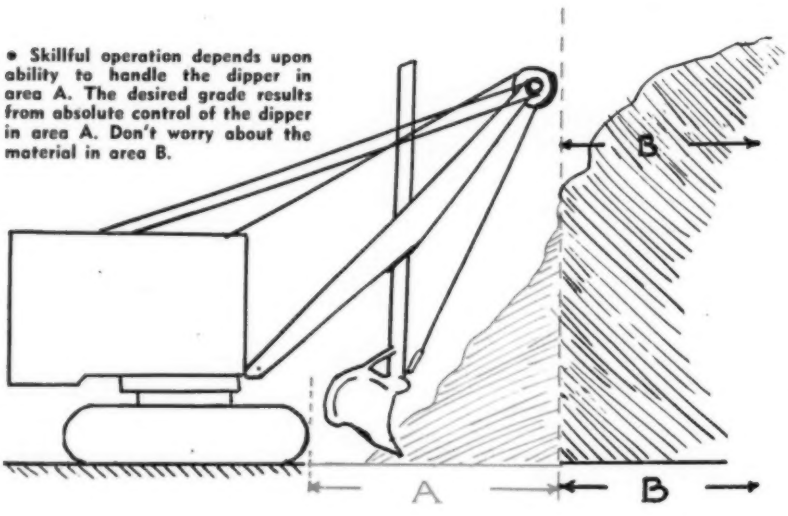
THE HIGH OPERATING speeds possible with many models of modern power shovels make possible the development of a technique of operation whereby it is difficult to determine where skillful operation ends and abuse begins. We hesitate to draw a line and say the line represents the "Peak of Efficiency" and that the same line also represents the "Line of Endurance"—that output beyond a definite figure is only obtained through abuse of equipment. Nevertheless such a line does exist. When part failures occur, or excessive wear is reported that cannot be attributed to other known causes, it is a safe bet that the "Limit of Endurance" for that shovel has been exceeded.

Since economy of operation is of primary importance, the logical practice is to stay a little below the peak of efficiency so that there is a margin of safety between what is required of the shovel and what the shovel is capable of doing.

Use of Hoist and Crowd Clutch

Many skillful operators hold that the most satisfactory method of operation is to adjust the hoist friction clutch so that it will toggle in. The crowd friction clutch is adjusted somewhat tighter, so that it can be toggled in, but will not toggle in under ordinary digging conditions.

When the dipper is brought back near the machine to begin its forward movement, the hoist clutch is engaged and the dipper allowed to go forward and up through the material at full governed engine speed. At the same time the hand is kept on the lever to insure a quick disengagement of the hoist clutch, should the dipper meet an immovable object.



• Skillful operation depends upon ability to handle the dipper in area A. The desired grade results from absolute control of the dipper in area A. Don't worry about the material in area B.

While the dipper is going forward and up it is crowded into, or retracted from the material, in such manner that a sufficient amount of material is obtained to fill the dipper without making unnecessary demands upon the power plant. It is possible to crowd the dipper into some material too much in an attempt to quickly fill the dipper with the result that there is a greater loss of time than if the operator did less crowding. Excessive crowding also causes the power plant to labor with the result that there are unnecessary power costs and machinery wear.

In the foregoing method of operation the crowd clutch is used in much the same manner as the swing clutches. The clutch is seldom in a fully engaged position.

Some new operators develop an undesirable tendency to hold the dipper into the cut with the swing clutches, keeping one hand on the swing lever constantly, while the hoist and crowd clutches are manipulated with the other hand. This may cause overheating of swing clutches to an extent where they do not function satisfactorily.

If the attack is planned upon the digging face after each move closer to the work, it will be found that most of the material can be loaded into the dipper without holding the dipper into the cut with the swing clutches. The method of operating with one hand on the crowd lever and one on the hoist discourages abuse of the swing clutches.

After each move closer to the

face of the cut, it is advisable for the operator to take the first dipperful near the center and succeeding ones from alternate sides until most of the material has been moved. Then the operator should clean up the face and floor to desired contour and grade.

It is common practice for many operators to bring the loaded dipper over a hauling unit at full swinging speed and "dump on the fly." In other words, very little attempt is made to arrest the swinging movement until the material begins to fall through the dipper door. The falling material thus exerts pressure on the hauling unit in two directions: Downward by gravity, and in the direction of the swing because of the forward momentum of the falling material. Such practice can cause excessive wear on all parts of the hauling unit which may add more to the cost of operation than is gained by the speed of moving yardage by "dumping on the fly." This is especially true in rock and other material which tends to dump as a unit rather than to be free-flowing.

One of these pressures can be largely reduced and whatever damage it causes to the hauling unit eliminated by bringing the swing movement to a full stop, or very nearly so, before dumping commences.

When the dipper has been filled at the digging face and the swing to the haul unit commenced, the dipper is quite frequently somewhat higher than the floor of the hauling unit. When the dipper is dumped into the hauling unit the pressure downward depends not only on the actual weight of the material, but may be considerably increased by the distance the material falls. The energy of this falling material must be absorbed by the hauling unit many times during a working shift. The results are metal fatigue to stationary parts on the unit, and excessive wear on any part which can or must move.

The resultant costs can be considerably eliminated by lowering the dipper into the unit, opening the dipper door and hoisting the dipper away from the load, rather than dumping the dipper at the height at which it arrives over the hauling unit. If this system is practiced by an operator he will acquire a skill in smooth operation which also places fewer stresses on all parts of the shovel. It will be found that yardage output does not suffer to an extent where criticism of the system is justified.

• After each move closer to the face of the cut, take the first dipperful near the center, succeeding ones from alternate sides, until most of the material has been moved. Then clean up the face and floor to desired contour and grade.

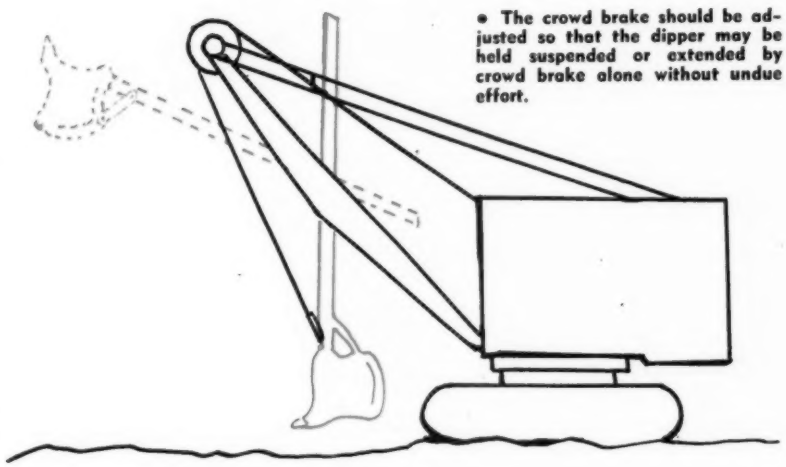
Crowd Brake Adjustment

The correct adjustment of the crowd brake plays a large part in the skillful and most productive operation of a shovel. The neglect of maintaining a correct adjustment, and poor maintenance of all parts, from brake lining to foot pedal, are factors which contribute greatly to output, wear, breakage of dipper teeth, and fatigue of the operator.

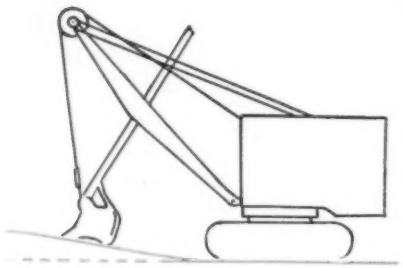
The tendency of many operators is to operate the brake with too loose an adjustment, or neglect to take up on adjustments when use causes the brake to operate too freely. When the dipper is retracted, or allowed to fall back, it may hit the ground in its backward fall unless the condition of all parts and the adjustments permit accurate control. This continual grounding of the dipper causes abrasion to the bottom of the dipper which is not necessary. If the dipper is only subject to the abrasion of the forward movement, the life of the dipper will be prolonged.

As many teeth are broken by a free-falling dipper hitting rock in retraction as in any other way. If the crowd brake is so adjusted that the dipper may be held with sticks in a vertical position with very little effort on the part of the operator, the dipper may be retracted cleanly, and started on its forward movement without contact with the ground until the teeth begin the forward cut.

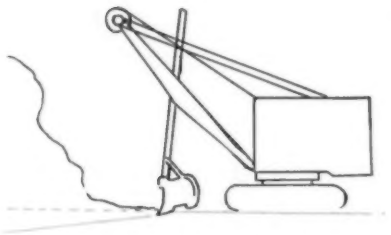
When a shovel operator has trouble holding a level grade it may be caused by the lack of proper adjustment of the crowd brake. If the brake is correctly adjusted and the grade persists in rising when the operator wants it level, the trouble is probably due to applying the crowd clutch too



• The crowd brake should be adjusted so that the dipper may be held suspended or extended by crowd brake alone without undue effort.



• Holding a grade that is "uphill" is caused by late use of the crowd.



• Gouging a hole in front of the shovel, or a tendency of the operator to hold a "downhill" grade, is generally caused by overcrowding the dipper or applying the crowd before the hoist.

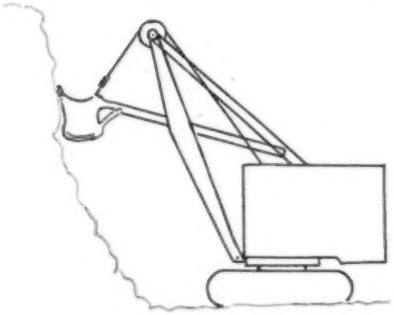
late after the hoist has been applied.

Dull dipper teeth, rounded up like sled runners, make it difficult for the operator to keep the grade down where it belongs. Adjusting the pitch of the dipper too flat has the same effect.

Gouging holes in front of the shovel, or carrying the grade on a downward slant, may be caused by using the crowd too soon. Or adjustment of the pitch of the dipper with teeth too low may be the cause.

In any case, a correctly adjusted and easy working crowd clutch makes it easier for an operator to follow grades.

• High boom and sticks well-in utilize the full value of the rear counterweight in tough digging on a high face.



Tough Digging on High Slopes

Where tough digging on high slopes is encountered, the boom should be raised slightly and the sticks kept well in. This will make short move-ups necessary. In this position the full balancing weight of the rear counterweight is utilized. The machine will remain more stationary and there's less probability of the machine tipping up on the front end of the caterpillar treads.

When the digging is tough enough to cause the rear end of the caterpillar treads to raise off the ground, care must be exercised that dipper teeth do not slip off from bedded rock or the digging face for this would cause the machine to fall back sharply and cause excessive stress on treads and revolving frame. If a shovel is allowed to fall back in this manner many times there is great danger of breaking caterpillar tread side frames and the revolving frame or upper deck just behind the rear rollers. The same things are true if a machine is allowed to rock back and forth over a hard uneven pit floor.

High Side and Low Side

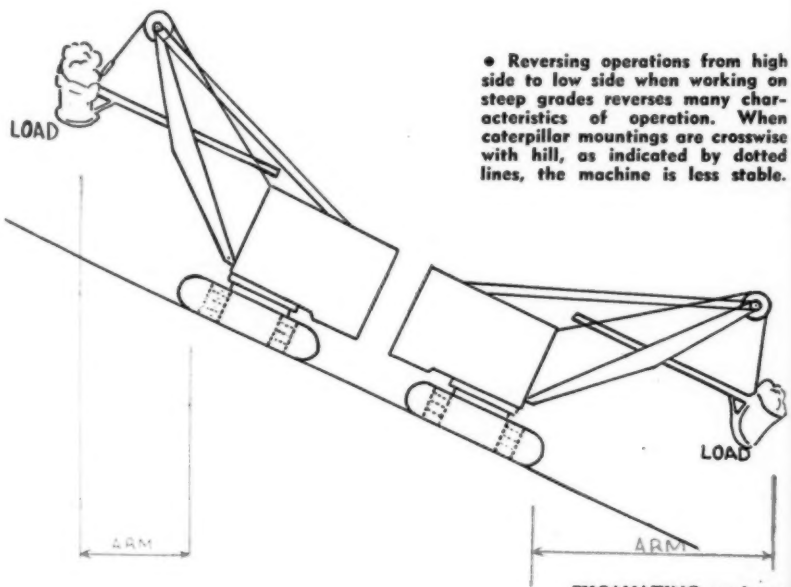
When working on a steep grade shovel operators frequently excavate material on the high side of the machine and load or dispose of the material on the low side. In moving large boulders in this manner much care and judgment must be exercised in estimating the balance of the machine. A boulder which is easily lifted on the high side of a shovel may tip the shovel over when it is swung to the low side.

It must be remembered that when a load is lifted from the low side and swung to the high side, the boom will seem very high and the stick will retract very easily. Boulders that can be easily balanced on the dipper on the high side will roll off easily on the low side.

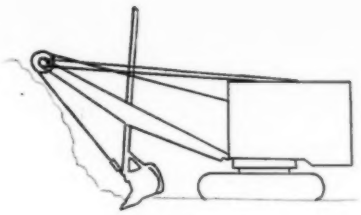
Tough Bottom

When the digging is tough in the bottom of the pit it is hard to keep the grade down, especially if the teeth are dull. The heavy crowding which is necessary may raise the boom. When the boom is raised by the crowd, the suspension cables are slack and if the dipper teeth slip off, the boom falls to the extent of this cable slack. This may break a weak suspension line or cause the cable to jump out of the sheaves at boom point or on gantry, or A-frame. Whenever the boom bounces from this cause, or any other, the operator should find out immediately whether or not the lines are in their correct places.

Bouncing the boom may cause



• Reversing operations from high side to low side when working on steep grades reverses many characteristics of operation. When caterpillar mountings are crosswise with hill, as indicated by dotted lines, the machine is less stable.



• A low boom for tough digging in the bottom of the cut utilizes the weight of the boom, dipper sticks, and dipper.

breakage of A-frame parts or even start cracks in the boom of the shovel. Lowering the boom slightly helps to keep it steady in digging a tough bottom. It presents the teeth at a new angle of pitch. Dull teeth will dig better if the boom is low. A tough bottom can also be dug more easily close in to the machine.

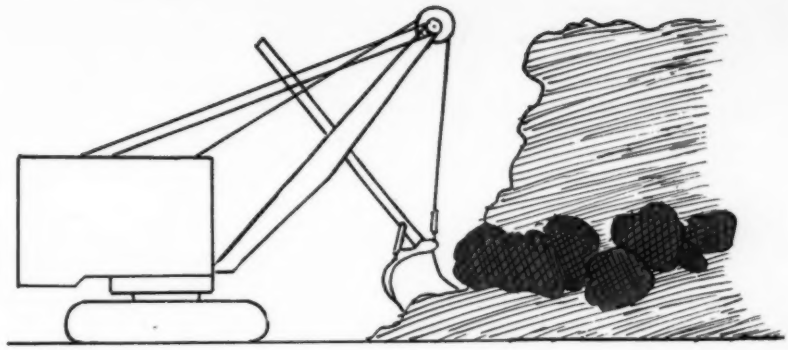
Handling Large Rocks

Where hauling units are operated on the same level with the shovel, difficulties may be encountered in unloading large rocks from the front end of the dipper into a high hauling unit. To remedy this the high hauling unit can be operated at a lower road level than the shovel so that the large rocks can be unloaded from the front end of the shovel dipper with ease. If operating the high hauling unit from a lower road level is impossible the use of a "stone boat" or other form of low hauling unit may be necessary.

If a stone boat is used large pieces of rock may be rolled or placed on it while the machine is loading the material which falls easily through the dipper into hauling units. The stone boat may be hauled at necessary intervals and emptied by allowing it to slide over the edge of a dump or upset it on level ground by using a rolling hitch fastened to the hauling unit.

Under no circumstances would large rock balanced on a dipper be unloaded by a quick reversal of swing clutches or by swinging the dipper against the side of the hauling unit or other immovable object. Such exhibitions may be spectacular and appear as a saving of time but the cost of such abuse to the shovel and hauling unit is greater than the value of any possible time saved.

In the absence of a low hauling unit the use of a chain or cable sling to load large objects into high hauling units will always be found cheaper than attempting costly gymnastics with the dipper.



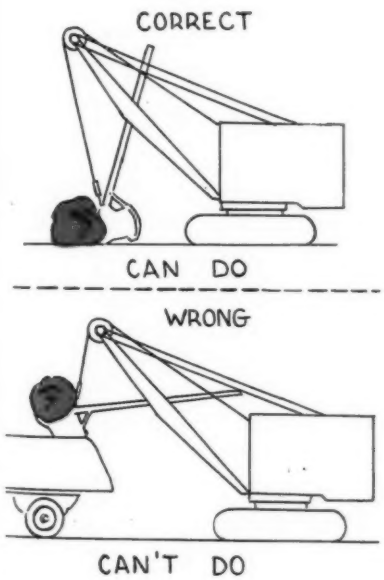
• A large boulder, or section of solid formation, may be hidden in the loose material of the digging face. Dig around it, not at it.

Pitch Braces

When the men at the factory place the pitch braces on the dipper of a new machine, they have no idea of the kind of material that the shovel will be called upon to dig. The angle at which the

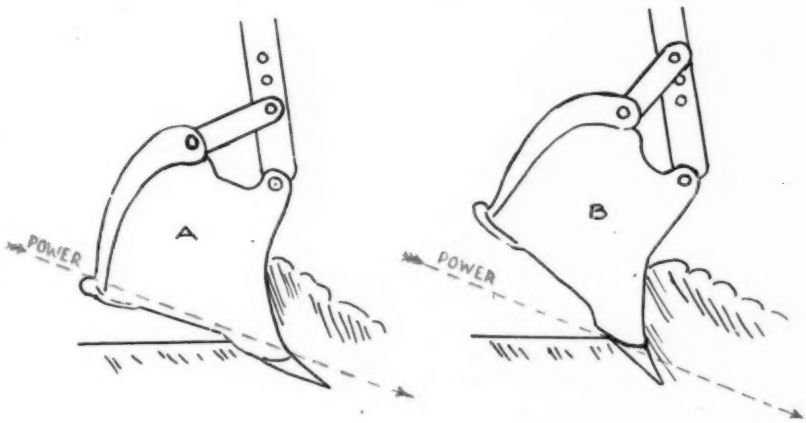
(Continued on page 42)

• Dumping loads too large to fall through the dipper.



Below: (A) When pitch braces are adjusted correctly, the resistance of material dug is overcome by the power being transmitted in line with points of the dipper teeth. Stress and shocks are taken by teeth in a direct line with the tooth base, strongest part of the dipper.

(B) When dipper is pitched too flat, power to dig is transmitted to the flat upper side of teeth. This incorrect adjustment may cause teeth points to break off and also, more power is required to fill the dipper, resulting in greater fuel consumption and unnecessary wear on machinery.



Taconite Mining
Past and Future

By R. W. WHITNEY*
(Formerly General Superintendent, Butler Brothers, Cooley, Minn.)

The problems associated with making commercially useful the low-grade ores of the Mesabi district are likely to become of great importance in the near future. In this article Mr. Whitney discusses production and cost facts in supplying taconite to a typical plant unit.

MOST OF US WHO ARE located on the Mesabi Range have had some experience in moving taconite in either small, medium, or large quantities, but only for the purpose of making available the so-called high-grade ores that are now being mined. The one exception to this is the Mesabi Iron Company, which in the early 1920's mined magnetic taconite for concentration near Babbitt.

We can all remember the type of equipment used at that time consisting of standard-gauge locomotives, dump cars, railroad-type shovels and six-inch churn drills mounted on wheels which were standard equipment at the time of this operation. Modern equipment should substantially reduce the costs of mining this material.

During this operation, the drill holes were spaced at 15-ft. intervals along a cut that was 30 feet deep. The holes were shot in series, using 60 per cent dynamite. A considerable amount of block holing or secondary blasting was necessary to break the material small enough to go through the three-cu. yd. dipper of a steam shovel, and so that it would not give trouble in the 48"x72" jaw crusher. From the information that we have been able to gather, the drilling speed was about one foot per hour with a bit life of approximately 20 inches between changes. No doubt, the drilling and blasting costs were extremely high during the operation.

We have had some experience during the last two or three years in taconite stripping. This material may be comparable to the taconite found along the Range with the exception of that found on the extreme eastern end which, I understand, is much harder. The ore layer that was being uncovered was overlaid by approximately 100 ft. of taconite and 35 ft. of surface material so that

Taconite, in its broadest and most commonly used sense, means all of the Mesabi Range iron formation, bounded by the Pokegama quartzite on the bottom and by Virginia slate on the top, which is not rich enough in iron to constitute commercial ore by present market standards. This broad definition can be subdivided into various types, such as cherty and slaty taconites, which in turn may be distinguished as to whether they are magnetic and unoxidized, or have been oxidized to hematites or limonites.
— Stephen Royce, Geologist, Crystal Falls, Michigan.

• Bucyrus - Erie 27 - T electric drills, like those below, and a 29-T, as shown on the right, were used for blast hole drilling by Butler Bros. during their experience with taconite stripping on the range during the past two or three years. The 27-Ts had six-inch tool strings weighing 1,800 lbs. and the 29-T was equipped with nine-inch tools weighing 2,700 lbs.

*** The author, who has pioneered many of the important improvements on the Mesabi Range, is considered one of the most capable and progressive operators in the district.**

any haulage costs on our job would not be comparable to those which would be obtained on a taconite mining program. However, drilling, blasting, and loading costs might be similar enough to make a reasonable estimate for taconite mining costs.

Drilling on our job was done by Bucyrus-Erie 27-T electric drills with a six-inch string of tools, the weight being 1,800 pounds, and a Bucyrus-Erie 29-T equipped with nine-inch tools, the weight being 2,700 pounds. The holes were drilled to a 40-ft. depth which was five feet below the floor of the cut. Spacing for the six-inch holes was 17-ft. centers, whereas a 20'x30' spacing was used on the nine-inch holes. Footage drilled per hour by the 29-T equipped with nine-inch tools was approximately 20 per cent more than that of a six-inch drill. Bit life on the nine-inch drill was at least three times as much as that of the six-inch drill and the cubic yards broken per foot of hole drilled was twice as much in the case of the nine-inch as in the case of the six-inch drill. This additional yardage is accounted for by the increased spacing between the center of the holes.

Four different powders were used in the blasting operation; namely, gelatin, 60 per cent; dynamite, 60 per cent; E.P. 85-65 per cent; and E.P. 83-50 per cent. No springing of holes was done as nearly all of the powder was loaded in the bottom of the hole; in some very rare cases, step loading was done to take care of tight spots. Substantially all of the holes were shot with Primacord, but earlier in the operation some blasting caps were used as detonators. In neither case were any missed holes encountered. The powder in the bottom of the nine-inch holes raised only half as fast as it did in the six-inch holes; consequently, we were able to keep our powder charge much lower and to increase the amount of stemming on the larger holes. Blasting results were much better when using the nine-inch holes than when using the six-inch. The powder factor varied between .5 and .7 pounds per yard of material. Only once or twice during the entire operation has any secondary drilling or bulldozing been done.

All of the loading was done with a 4½-cu. yd. electric shovel served by 15-ton rear-dump trucks. Normal loading speed was at the rate of about 4,500 to 5,000 cu. yds. per 24 hours of operation.

Road maintenance was not a problem; however, cutting of tires at the loading point and at the dumping point was severe, so it was necessary to haul in fine material which could be spread at both of these points to keep the tire cutting to a minimum. In addition, a bulldozer was stationed at the shovel all of the time to push the rock spillage off the road. Of course, a road patrol was used for road maintenance between the pit and the dump; also, a bulldozer was kept on the dump at all times to maintain it.

Any discussion of methods or costs of mining taconite presented at this time is necessarily based on present equipment plus expected improvements during the next year or two. Progress in the manufacture and design of present-day equipment over a period of the next five to 15 years may change the picture considerably. There also may be radical or rather revolutionary changes in the method of moving materials which will alter the plans and cost estimates.

This discussion is built around the problem of supplying taconite to what we will call a typical plant unit: namely, a beneficiating plant with an annual output of one million tons of concentrates at a concentration ratio of 3:1 using 160 days as an operating season. If the concentration of taconite is successful, it is possible these plants will be operated the year around. However this will not change the requirements for equipment. This typical unit will then require three million tons of crude ore annually, 18,750 tons per 24 hours, or approximately 900 tons per hour.

Apparently the lower cherty formation is very persistent over

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The Minnesota state executive council on December 11, 1945 awarded contracts to prospect for iron ore on 17 state-owned mining units in northeastern Minnesota.

Included in the awards were two properties covering 160 acres containing taconite granted to the Reserve Mining Co., Ramsay, Mich., who are said to be planning to build a $10,000,000 taconite concentrate plant in the Aurora area. However, there is no indication that there would be an immediate development of the Aurora taconite field.

Fifteen properties including about 9,000,000 tons of iron ore were awarded to J. A. Mackillican of Hibbing.

It is believed on the Range that obtaining leases is part of a long-range plan for taconite mining in the future. Earlier in the year the state legislature paved the way for water rights by a law permitting the use of the waters of Birch Lake and the Dunka River, which flows into the lake, for taconite development.

This article is the substance of a talk given by the author at the 1945 symposium for mining engineers presented by the Center of Continuation Study of the University of Minnesota and published in a bulletin (Information Circular No. 5 of the Mines Experiment Station) of the University of Minnesota Institute of Technology.

areas that cover several miles, so for our purpose, we will assume an area of one square mile, the reserve of which would be 432 million tons of crude or 144 million tons of concentrates assuming the depth to be 200 feet. This, then, will limit our haul to not more than one-half mile from the shovel to the crushing plant. We will also assume that the taconite is overlaid with 25 feet of surface, the removal of which is not a serious problem as the stripping ratio would be .06 cu. yd. per ton of crude or .2 cu. yd. per ton of concentrates. However, we will take this item into account in our final cost figures. Mining will be done in 35-ft. benches which will cover the entire square mile. Each one of these benches is equal to 24 million tons of crude taconite or approximately eight million tons of concentrates which means that the primary crushing equipment can stay in the original location for at least eight years. No grading problems have been taken into account for it was felt that the concentration plant should be arranged to take the material as it will be encountered in the mine. It would be extremely difficult to have enough working faces or move the equipment from place to place to maintain a uniform grade of material.

• Mining iron ore in Minnesota. The drills to the right are Bucyrus-Erie 27-Ts and the shovels are Bucyrus-Erie with 3¼ and 2½-cu. yd. dippers.

There is not much use in discussing the removal of the overburden as this would present no new problems. No doubt this material will be hauled some distance, probably two or three miles to deposit it off the formation, or it is possible that a large portion of it will be used for dams to impound the sludge from the beneficiation plant. Cost of moving this stripping material will amount to 2.1 cents per ton of crude ore.

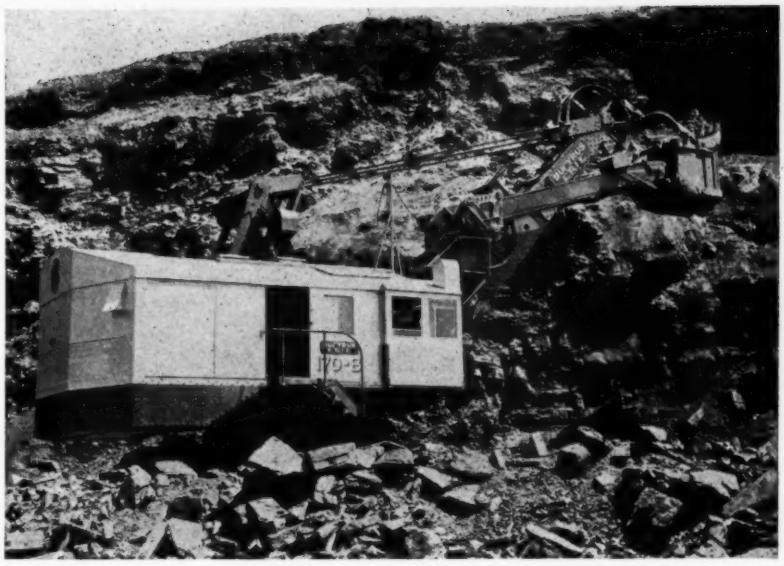
• With drilling and blasting the key to an operation in which hard material is being excavated the author proposes the use of Bucyrus-Erie 42-T drills with nine-inch tools, which give a weight of 500 lbs. per inch diameter of the bit, for taconite mining in the future.

Drilling and blasting is the key to an operation in which hard material is being excavated, for if it is shot well, the shovel will have no trouble in digging it and if it can be put into trucks or whatever haulage equipment is being used, it can be handled readily. Therefore, the choice of the drilling equipment along with the choice of the explosives to be used, as well as the spacing of the holes and loading of the same, will be the most important factors in discussing the future mining of taconite. It is proposed to use Bucyrus-Erie 42-T drills with nine-inch tools which weigh 4,500 pounds; this gives a weight of 500 pounds per inch diameter of the bit. If this model of drill is used, it is necessary to have bits of nickel alloy as the ordinary carbon steel bit will not stand more than 300 pounds. The tools swung by this machine are much heavier than those swung by the 29-T or the 27-T. In each of these latter cases, enough tools are carried to equal 300 pounds per inch diameter of the bit. The 42-T has been used almost exclusively in the Pennsylvania hard coal mines as well as at the International Nickel Mines of Canada. The experience in both of these locations shows that it will out-perform the 29-T by approximately 100 per cent. It is estimated that the average drilling progress will be two feet per hour, footage per bit two to four feet, the spacing of the holes 20′x26′, and the burden per foot of hole will be 18.2 cu. yds. or 40 tons. Therefore, the capacity per drill per day would be 2,000 tons. On this basis it would require five drills for each shovel working. The estimated cost of operating the drill, which includes everything but depreciation, would be five cents per ton.

Assuming a half pound of 60 to 90 per cent powder per ton of rock broken, this would make the powder cost approximately six cents. The costs of delivering stemming to the holes, placing it in the holes, Primacord, detona-

tors, and other blasting items are included above. If it is necessary to do secondary blasting, a crawler-mounted compressor along with drills mounted rigidly on it should be provided. As this operation progresses, no doubt a drilling and blasting practice will be developed whereby little, if any, secondary blasting is required. The total drilling and blasting cost as shown above would be 11 cents per ton exclusive of depreciation.

A Bucyrus-Erie 170-B shovel which normally carries a 6½-cu. yd. bucket, but which in this case would carry a five-cu. yd. heavy-duty manganese bucket, should be used if it is possible to get a gyratory crusher large enough to take the pieces that will go through the dipper opening of the five-cu. yd. bucket which is 56"x 68". While the average production from the mine has been put at 900 tons per hour, the crusher should have a peak capacity of 1,200 tons per hour in order to take the surges. This shovel has a working weight of 500,000 pounds, whereas a Bucyrus-Erie 120-B five-cu. yd. shovel has a working weight of 350,000 pounds. Because of the nature of the loading, it seems that it would be worthwhile to have additional weight to eliminate an excess amount of mechanical breakdowns. Assuming that this 170-B shovel would make only two passes per minute (it makes nearly three passes per minute in the average operation on the Range) and that it would carry only six tons on each cycle (the average tons per pass while loading ore on the Range is between 12 and 14 tons) this would give it a theoretical capacity of 735 tons per hour. If the shovel efficiency is 85 per cent and the transportation facilities which serve it are 90 per cent, then the overall job efficiency would be 76.5 per cent. This means a practical output of 560 tons per hour, 4,500 tons per shift, or 13,500 tons per 24 hours. Therefore, two shovels are required for the production, but a third one is included as a standby machine. Direct operating and maintenance costs for loading would be approximately three cents per ton.



• Because of the nature of the loading, the additional weight of a Bucyrus-Erie 170-B eliminates an excess of mechanical breakdowns that might occur with a lighter shovel. The 170-B normally carries a 6½-cu. yd. dipper, but may be equipped for this work with a 5-cu. yd. heavy duty manganese dipper.

In this setup a large gyratory crusher is placed below the floor of the first cut which, as we have said before, will mean a level haul for it. If it is desired to take the second 35-ft. lift without lowering the crusher, this material could be hauled up 450 feet of eight per cent grade, but offhand, it would seem feasible to lower the crusher for the second cut rather than haul the material up to it. Because of the level haul, either bottom-dump trucks or side-dump trucks of large capacity should be used for this haulage job. The maximum truck cycle would be 15 minutes; therefore, if we assume 30 tons per trip, each truck should deliver 120 tons per hour to the crusher, or it would require four trucks to serve each shovel. In addition, three standby trucks would have to be purchased, making a total of eleven. Road maintenance should not be much of a problem. Probably the largest difficulty to be overcome is the cutting of tires. This can be done in one of many ways, but the easiest would be to cover the road with coarse tailings from the plant or with gravel. If extremely large size tires were used so that air pressure could be at a minimum, this would tend also to reduce the cutting of tires. It will be necessary to have tractors, sprinkling wagons, a main service garage and other miscellaneous small items. Hauling costs on this basis would be five cents per ton with an additional 1½ cents for road building and maintenance, making a total of 6½ cents per ton.

The estimated investment necessary to equip this mine would be approximately as follows:

Three 170-B shovels at $112,000 each	$336,000
Ten 42-T drills at $20,000 each	200,000
Eleven 30-ton trucks at $15,000 each	165,000
Two D-8 tractors at $9,500 each	19,000
One No. 12 auto patrol	7,500
Miscellaneous equipment (garage, transformers, power lines, small tools, etc.)	100,000
Total	$827,500

Depreciation on shovels and drills figured at 10 years.
Depreciation on trucks, tractors, and patrols figured at 15,000 hours.
Depreciation per ton of crude ore would be 3½ cents.

Summing up the costs at the mine, excluding overhead, taxes, or building a mine shop and office, would be:

	Per Ton of Crude Ore
Stripping	$.021
Drill and blast	.110
Loading	.030
Road maintenance	.015
Hauling	.050
Mine supervision	.010
Payroll taxes	.015
Amortization of investment	.035
Miscellaneous	.015
Total	$.301

At a 3:1 concentration ratio, this would amount to slightly more than 90 cents per ton of concentrates produced.

Tough Digging!

H. H. Hall Construction Company of East St. Louis makes efficient use of tractor equipment to dig up unscarified, stony, macadam pavement in preparing to lay a new concrete road in local industrial plant yard.

• Digging up this tough macadamized pavement is an unusual job for tractor equipment, but Hall's Dozer-Shovel is doing an efficient job.

THE H. H. HALL Construction Co. of East St. Louis, Ill., is making efficient use of a Dozer-Shovel purchased six months ago to dig out a stretch of tough, stony macadamized road which will be replaced with a modern concrete thoroughfare in the yards of the Socony-Vacuum Oil Company plant in East St. Louis.

About a quarter of a mile of asphaltic stone pavement is to be replaced with a 26-ft. wide nine-inch concrete pavement which will have a one-inch asphaltic expansion joint center strip, marginal bars, cross expansion joints about every 40 ft. and a three-fourths-inch thick, nine-inch deep expansion joint along the curbs. The job involves the excavation of about 1,000 cu. yds. of old roadway and subsequent laying of concrete.

This job is unusual in the respect that tractor equipment is being efficiently used to dig up this tough roadway that had not been scarified before excavation was started. The Bucyrus-Erie Dozer-Shovel on an International TD-9 tractor carries a ¾-cu. yd. (struck measure) bucket equipped with four forged steel digging teeth slipped over the cutting edge of the bucket and held in place with two bolts per tooth. The bucket teeth are standard equipment with the machine and are used for digging materials that are difficult to penetrate with only the bucket lip.

• The Dozer-Shovel works from the excavated portion of the road. After the bucket has been filled, the operator backs the machine a few feet, makes a 180° turn, and dumps into trucks that are backed into the excavation at right angles to the road being excavated.

The machine has a digging down pressure of 4200 lbs. on the bucket teeth. The Dozer-Shovel maintains the original balance characteristics of the tractor, thus making full use of traction afforded by a flat track. The bucket takes sharp, clean cuts with no trace of gouging or washboard finish. Even with a heavy load in the bucket, the unit does not nose forward to cause excessive wear on the front idlers of the caterpillar mounting.

Dozer-Shovel Operation

The Dozer-Shovel works from the excavated portion of the road. After the bucket has been filled the operator backs the machine a few feet, makes a 180° turn and dumps into trucks that are backed

• After the old roadway has been excavated the area is cleaned and graded with an Adams road grader with 12-ft. blade. Transit mixers dump into a 1-cu. yd. concrete bucket on the Insley crane in the background.

into the excavation at right angles to the roadway being excavated. Three dump trucks, a Reo, International and Mack, ranging in capacity from 2½ tons to 4-tons, haul the material excavated by the Dozer-Shovel to one of the Hall Construction Company's yards about 1½ miles from the job where it is being used for road fill. The trucks make the round trip in an average of about 20 minutes carrying about four cu. yds. of excavated material each trip.

After the old roadway has been excavated to a depth sufficient to take a new nine-inch pavement the roadway area is cleaned up and graded with an Adams road grader with a 12-ft. blade. Forms are then set and concrete is hauled to the site in transit mixers from Hall's yard. The Transit mixers dump into a 1-cu. yd. concrete bucket on an Insley crane with a 30-ft. boom.

• During its 36 years in business the H. H. Hall Construction Co. did contracting work in all sections of Illinois, Missouri and Arkansas. Two early construction scenes are shown here. Top: This 20" wooden stave pipe was laid in 1910 and was used to supply water to Centralia, Ill., until oil was found in the reservoir area and the site was abandoned seven years ago. The sections are joined by ramming, as pictured. Lower: Over 20 years ago this was Hall's "transit mix" system for road paving jobs.

Eight Jaeger transit mixers, four three-cu. yd. and four four-cu- yd., on International and Reo trucks are used for the transit mix concrete business carried on by the company in conjunction with its contracting business. Sand, stone, and cement for this transit mix business are brought to the H. H. Hall Construction Company yards by rail and the sand and stone is loaded to the mixing bins by clamshells. During the winter months the sand and stone is heated in mixing bins by means of a blow torch heating air that passes through a six-inch pipe that zig-zags through the material before it is loaded to the mixers. Hot water is also used in the transit mixers during the cold months.

The time the loaded transit mixer leaves the Hall yards is punched on a card by a time clock. The driver carries the card with him and the time he arrives and leaves the job is noted on the card which is then returned and punched on the time clock at the yard when the driver arrives for his next load. In this way delays on the job where the concrete is being delivered can be charged against the customer when con-

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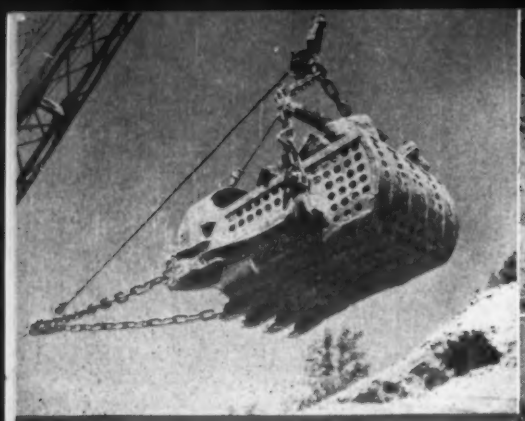
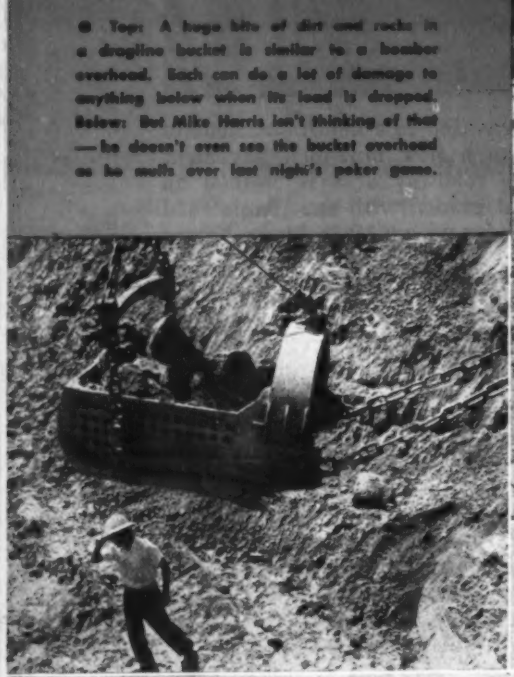


● Left: The operator didn't see him and rocks showered on Mike before he knew what hit him. Mike had plenty of time to think while in the hospital recovering from a badly smashed shoulder. And he did think too — how to prevent similar accidents to others. Below: His solution was a "spotter" system.

● Top: A huge bite of dirt and rocks in a dragline bucket is similar to a bomber overhead. Each can do a lot of damage to anything below when its load is dropped. Below: But Mike Harris isn't thinking of that — he doesn't even see the bucket overhead as he mulls over last night's poker game.



He Didn't K

● Pretty steep climb there — even for that tractor. But don't give 'er the gun too much, brother, 'til you know what's on the other side of that bank. Do you know? You should.

● The operator of this machine [illegible] know — the other side of the bank [illegible] just as steep as the one he had cli[illegible]

the machine to warn workers who come ...ously near. Mike's bad shoulder pre- ...d him from returning to his old job so the ... gave him the job when he suggested ...dea. No one is more zealous about his ... than Mike.

...LES FOR WORKING SAFELY NEAR ...AVY CONSTRUCTION EQUIPMENT

Move machinery only when sure everyone is in the clear.

Ride only where seats are provided and never jump on or off.

When cranking engines, stand in the clear — thumb beside fingers — and pull, don't push.

Keep out from under suspended loads.

Block suspended parts before repairing, moving, or leaving.

Keep clear of moving machinery — do not oil or repair while in motion.

Maintain equipment in good condition.

Know the safe load for any equipment and never exceed it.

Keep all parts of equipment at least ten feet from electric power lines.

Keep at a safe distance from edge of the cuts or fills.

Drive at a safe speed, and shift gears at start of steep grades.

Guard against fires when fueling, and against steam when checking water.

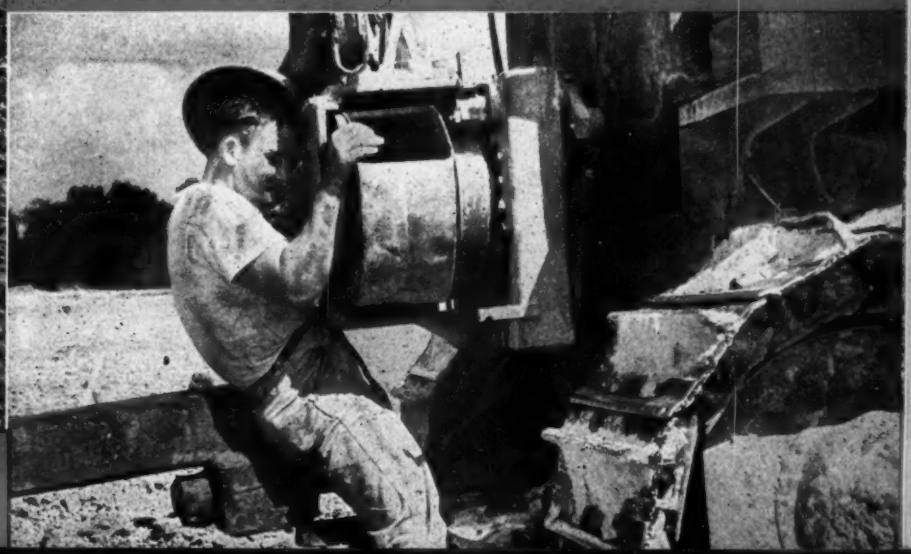
...graphs on this page are from the National Safety Council's ... slidefilm, "Construction Equipment Safety" The safety rules above are in essence an outline of the points treated in detail ... slidefilm.

...KW — —

Everyone told his widow he had been the best cat skinner on the job — and that this was his first mistake.

● Above: Good backing! He's heading straight for the drawbar of the sheepsfoot roller for an easy coupling. Below: No wonder he can't miss with that man back there ready to guide the drawbar and slip the coupling into place — but, does the tractor operator know he's back there?.

● No, the operator didn't know — or he forgot to wait for a signal. The result? Internal injuries — painful and serious, but not fatal. An operator should always make sure he's in the clear, especially before backing. And anyone working near moving machinery should warn the operator of his presence.



Shots from the FIRING LINE

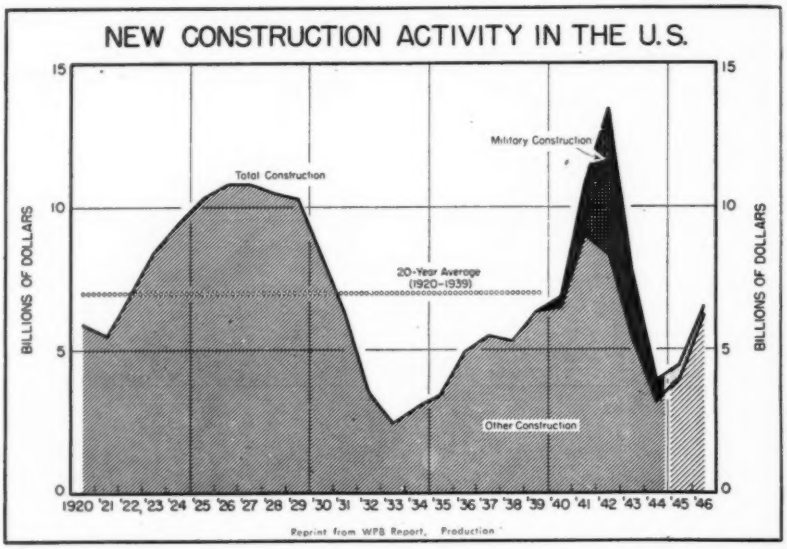
A.E.D. to Hold Annual Meeting in Chicago

An industry with a war production output of around a billion dollars worth of tractors, bulldozers, cranes, paving machines, shovels and many other items of heavy construction, roadbuilding and highway construction machinery, will take stock of its post-war situation in relationship to problems engendered by the war and chart its course for the first full year after the war as a key factor in an important segment of the national recovery program, when the Associated Equipment Distributors (A.E.D.) holds its 27th Annual Meeting at the Edgewater Beach Hotel, in Chicago, from January 28 through January 31.

Nationally known leaders of thought in industry and in government will discuss the pros and cons of orderly absorption of vast quantities of surplus heavy construction machinery and equipment. There has been considerable confusion, misunderstanding, duplication of authority and other factors, disturbing both to the industry and governmental functionaries entrusted with the task of such disposal — problems incident to continued exercise of Government restrictions built into the pattern of reconversion, but following lines of policy and uncertain time limitation that are likewise confusing to this industry whose products and cooperation have been credited by all war leaders with having played a major role in the engineering phase of the war on all world fronts — problems incident to full execution of A.E.D.'s program to provide "new and constructive opportunities for returning veterans," etc.

A.E.D. President H. O. Penn of New York, will preside over a program for the four days' sessions arranged by the Program Committee, under the chairmanship of Executive Vice-President F. B. McBath of Portland, Oregon.

Interest in these and other vexing problems which compelled the industry to go "all out" for the war effort to an extent that domestic needs for this type of machinery and equipment had to be placed on the post-war agenda, has caused such interest that registration will be restricted to A.E.D. members.


NEW CONSTRUCTION ACTIVITY IN THE U.S.
BILLIONS OF DOLLARS
BILLIONS OF DOLLARS
15
10
5
0
Total Construction
Military Construction
20-Year Average (1920–1939)
Other Construction
1920 '21 '22 '23 '24 '25 '26 '27 '28 '29 '30 '31 '32 '33 '34 '35 '36 '37 '38 '39 '40 '41 '42 '43 '44 '45 '46
Reprint from WPB Report, Production

• Arthur Whitcomb, Inc., Keene, N. H., used a Bucyrus-Erie ¾-cu. yd. shovel to load trucks with fill from an old railroad embankment for the grounds of the Pittsburgh Plate Glass Co. plant at Keene. The shovel averages 900 cu. yds. of excavation a nine-hour shift.

Report on New York Road Program for Next Decade

A program calling for construction of arterial highways and parkways in New York City at a cost totaling $285,000,000 in the next five years, with $100,000,000 of the work scheduled for 1946, was outlined in a report submitted to Mayor LaGuardia by City Park Commissioner Robert Moses.

Moses said agreements had been reached with the federal and state governments providing for substantial aid for the program. Figures appended to the report revealed that this federal-state assistance would cut the city's share of the total cost to $170,000,000.

Pennsylvania Receipts $976,563,000 in 10 Years

Pennsylvania state highway receipts during the decade 1934-1943 aggregated $976,633,000, composed of $860,451,000 motor fuel tax, registration fees, and motor carrier imposts $98,975,000 Federal Aid; $2,219,000 other Federal contributions; $6,738,000 received for highway use from local government jurisdictions; $2,478,000 earning of sinking fund; and $5,702,000 miscellaneous income.

Disbursements during the same period totaled $958,738,000, covering $20,099,000 cost of collection and administration of motor vehicle imposts; $299,289,000 for construction; $240,787,000 for maintenance; $75,517,000 for administration, engineering and equipment; $35,137,000 for state highway police; $33,257,000 repayment of

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INTERNATIONAL INTERNATIONAL HARVESTER **Industrial Power**

• J. H. Beckman Construction Co. of Sioux Falls, S. D., is moving 32,000 cu. yds. with a Bucyrus-Erie 4-cu. yd. (struck measure) two-wheel scraper and an International TD-14 tractor in a gravel resurfacing job for Minnehaha County, S. D.

borrowed money and $29,577,000 interest on debt; $106,528,000 expended on local roads or made available to minor jurisdictions for that purpose; and $118,547,000 for non-highway purposes. (This does not include the construction of or tolls collected on the $70,000,000 Pennsylvania Turnpike administered by the Turnpike Commission, which was financed by a Federal grant of $28,000,000 and a bond issue of $40,800,000.)

These figures are calculated from data in the "Highway Facts" studies being issued by the National Highway Users Conference for each state, compiled largely from official tables of the Public Roads Administration.

Virginia Reelects RBA Officers at Meeting

Officers of the Virginia Road Builders' Association were reelected at the group's annual meeting in Richmond, as follows: President, W. A. Pennick of Richmond; vice president, A. B. Burton of Lynchburg, and secretary-treasurer, Henry C. Hofheimer II of Norfolk. Added to the board of directors were Edmund Pendleton, Jr. of Wytheville and J. K. McGrath of Harrisburg.

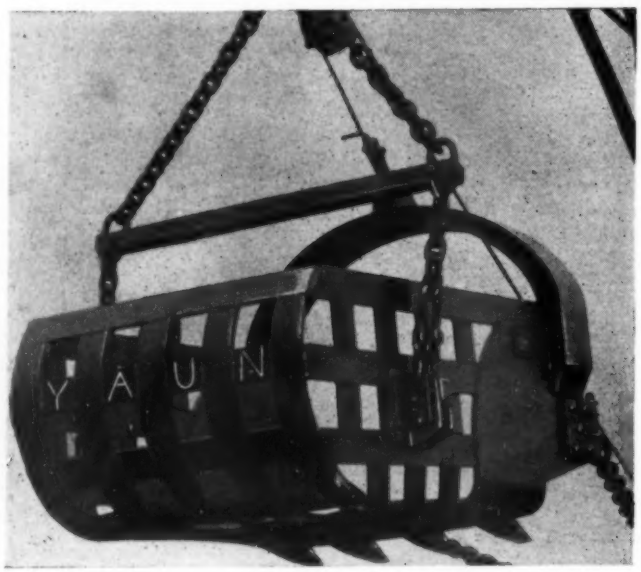
Promise Excellent Program For ARBA Convention

A brilliant array of authorities on design, construction and maintenance of highways and airports will address the forty-third annual convention of the American Road Builders' Association at the Stevens Hotel, Chicago, January 14-17, 1946, James J. Skelly, president, has announced. Major General Philip B. Fleming, administrator, Federal Works Agency heads a notable list of representatives of Congress, government agencies, state associations, engineering colleges, highway departments of states, municipalities and counties and others who will make addresses, lead discussions or offer reports.

Hon. J. A. Robinson (Utah) chairman of the House Roads Committee, and Hon. Jennings Randolph (W. Va.) a leader in airport legislation, will be among the Congressional figures. Herman A. MacDonald, Boston, president of the American Association of State Highway Officials and Massachusetts Commissioner of Public Works, will speak on the cooperative participation of state, county and urban agencies in administering the Federal-Aid Highway Act.

Other well known speakers include Commissioner George H. Field, Bureau of Community Facilities, FWA; Lieutenant General Raymond A. Wheeler, Chief of Engineers, United States Army; H. A. Radzikowski, chief of the Division of maintenance, Public Roads Administration; J. T. Callaway, assistant to the Vice President, Goodyear Tire & Rubber Company and Spencer Miller, Jr., New Jersey's State Highway Commissioner. Mr. Miller's address will have to do with highway safety.

The Airport Division of ARBA which



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Two Types of All-Welded Buckets.

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DRAGLINE BUCKETS
Patented
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ZONE 1
"Caterpillar" Diesel track-type Tractors equipped with bull-dozers.

ZONE 2
"Caterpillar" Diesel track-type Tractors for loading and pulling scrapers.

ZONE 3
"Caterpillar" Diesel wheel-type Tractors for high-speed hauls.

DOES THE JOB *better, quicker, cheaper*

"Use the right tool for the job" is an old rule—and a sound one—that is followed in every successful factory, shop or craftsmen's trade. It is just as applicable in the great industry of earthmoving. Contractor, customer and community alike benefit when it is put into practice.

Here, for instance, on the Canton-Akron airport project, three contracting concerns got together in setting the job up *right*—with ZONED EQUIPMENT to fit the varying hauls.★ And that's the one "best" way to get top results on *any* large earthmoving operation.

The "Caterpillar" line has been steadily broadened to enable the contractor to "zone" his jobs with equipment obtained completely from *one source*—under the quality-and-performance responsibility of *one manufacturer*—and serviced through *one dealer* organization that is thoroughly equipped, experienced and always within easy reach.

What do *you* need to zone your next jobs for better, quicker, more profitable results? Talk it over with your "Caterpillar" dealer. And keep in mind that "Caterpillar" *job-engineering* help is available if you want it.

★Illustrations show some of the *zoned equipment* used on this project. It includes 8 "Caterpillar" track-type Tractors operating carry-scrapers on heavy hauls of 1000 feet and under; 3 operating 'dozers on the "push" distances; and 8 "Caterpillar" Diesel wheel-type Tractors operating scrapers on the "speed" hauls of 2000 feet and over.

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is concerned with the design, construction and maintenance of airports, will have important sessions headed by Col. E. R. Needles, distinguished consulting engineer.

Michael Straus Succeeds Bashore as Commissioner

President Truman appointed Michael W. Straus United States Commissioner of Reclamation to fill the office vacated through the retirement of Harry W. Bashore.

Mr. Straus resigned his office as Assistant Secretary of the Interior to undertake the new task when Commissioner Bashore insisted upon exercising his retirement rights at the end of 39 years of service with the Bureau of Reclamation. Secretary of the Interior Harold L. Ickes, who transmitted Bashore's resignation to the President said:

"I received Commissioner Bashore's resignation with great regret and accepted it only on his insistance that he be relieved of the responsibilities that he has discharged with great distinction. I am pleased with the appointment of Mike Straus, who has worked intimately with the Bureau of Reclamation for more than 12 years, and who is entirely familiar with the enlarged program that must drive forward."

Commissioner Straus was born in Chicago in 1897 and attended the University of Wisconsin, specializing in chemical engineering until the first World War when he enlisted in the Navy and became a deck officer. After that war he entered newspaper work, including a term as managing editor of a Chicago afternoon daily and National editor of a New York afternoon daily, eventually coming to Washington as a press association correspondent.

Mr. Straus entered Government service in 1933 as an assistant to the Federal Public Works Administrator. In the early 30's that agency financed the greatest reclamation building program the United States had then witnessed. In various offices and in extended visits to the areas of operations in the West, Straus has devoted his effort since joining the Federal service to resource development and construction with the exception of one period. During the war, at the request of Donald Nelson, Straus was drafted into the War Production Board for a year as director of the War Production Drive Labor-Management Committee.

He returned to the Interior Department in 1943 and in March of that year gave up his career service status with top civil service classification when nominated by President Roosevelt as First Assistant Secretary of the Interior and confirmed in that position by the Senate. Since then, by delegation of Secretary Ickes he has had immediate supervision of the Bureau of Reclamation, the Bureau of Mines, the Geological Survey, and the Petroleum Conservation Division — all western resource development agencies of the Department of the Interior. As he once worked with the late Commissioner of Reclamation Elwood Mead, he continued to work with former Commissioner John C. Page and retiring Commissioner Harry W. Bashore and their Reclamation staffs. In the past year, one of his principal interests has been preparation for the post-war Reclamation program.

Former Commissioner Bashore has established an outstanding record in his long service in all branches of the Bureau of Reclamation in the field and in Washington. Under his guidance the Bureau was reorganized on a regional basis and investigation on 15 major river basins, including the Missouri River, was undertaken. Commissioner Bashore knew the Bureau from its very beginning for he joined its staff in 1906 when the agency had been in existence only four years. His first task was as engineering aide and later superintendent on the North Platte Project in Nebraska and Wyoming.

In 1927 he became construction engineer on a project to irrigate 32,000 acres in eastern Oregon. Three years later he was called to Spokane, Washington, where for two years he made the engineering investigations that preceded the building of the World's largest concrete dam—Grand Coulee Dam on the Columbia River to store water

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Smooth, non-grabbing action that adds miles to tire life.
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No letdown in efficiency on steep grades or under prolonged use.
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Fifty Years of Wire Rope

BACK in 1896, wire rope was not the highly specialized product it is today—neither was the equipment on which it was used.

The past 50 years have brought amazing developments in methods and equipment. Huge excavators take 35 cubic yards of earth at a 'bite.' Well drillers go down 15,000 feet into the bowels of the earth in their quest for oil. Huge logs are 'snaked' out of the tall timber like so many match sticks. Elevators supply vertical transportation in skyscrapers reaching up to the clouds. Man flies in aircraft around-the-world in less time than once required to go a few hundred miles.

Wire rope as a part of this equipment has also changed. Through the years Macwhyte Company has continually kept pace with equipment progress by specializing in the drawing of wire and the making of wire rope and wire rope slings.

We shall continue every effort to merit your wire rope and wire rope sling business.

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for irrigating more than a million acres of new land which will provide thousands of farms for returning service men and others.

In 1932 he went to Sacramento to conduct preliminary investigations on another great multiple-purpose Reclamation project—the 2,000,000 acre Central Valley development in California.

The following year he became construction engineer and supervised the building of the Alcova and Seminoe Dams on the Kendrick Project in Wyoming.

From Wyoming to Washington was but a step for Harry Bashore after having given such an account of his administrative ability and capacity for thorough, careful workmanship. He was appointed Assistant Commissioner of the Bureau of Reclamation in 1939, and succeeded John C. Page as Commissioner in 1943.

Reared on a farm in Missouri, Commissioner Bashore combined practical knowledge with training as an engineer and a wide background of experience. He was graduated from Lagrange College in Lagrange, Missouri, in 1899, with an A.B. degree, and from the University of Missouri, Columbia, in 1906, with a B.S. degree in civil engineering. He is a member of the American Society of Civil Engineers.

Commissioner Bashore submitted his resignation to Secretary Ickes last September after reaching the optional retirement age and resisted efforts to cause him to reconsider. He has declared that he wished to care for personal matters which he had been forced to lay aside because of his heavy duties and has withheld announcement as to his future plans.

Dickinson Regional Reclamation Director

Secretary of the Interior Harold L. Ickes appointed Phil Dickinson of California as an assistant regional director of the Bureau of Reclamation, with headquarters in Sacramento, it was announced by Regional Director Richard L. Boke. Leland O. Graham was appointed regional counsel for the office.

Williams Gets Post on Columbia Basin Project

Roy B. Williams, who supervised construction on the Kittitas Division of the Yakima Project of the Bureau of Reclamation in Eastern Washington and who directed the building of several other outstanding irrigation works for the Government, has arrived at Coulee Dam from Friant, California, to become assistant supervising engineer for the Columbia Basin Project, the Bureau's No. 1 postwar development.

Georgia's Highway Budget Biggest in History

Georgia's State Highway Board has approved a $32,000,000 road building program for 1946, the largest annual construction outlay in the state's history.

More than half the construction costs will be borne by the federal government, since the state has approximately $9,000,000 in federal funds held over since construction was stopped by the war, and the state will get $11,500,000 annually for the next three years from the federal postwar road program.

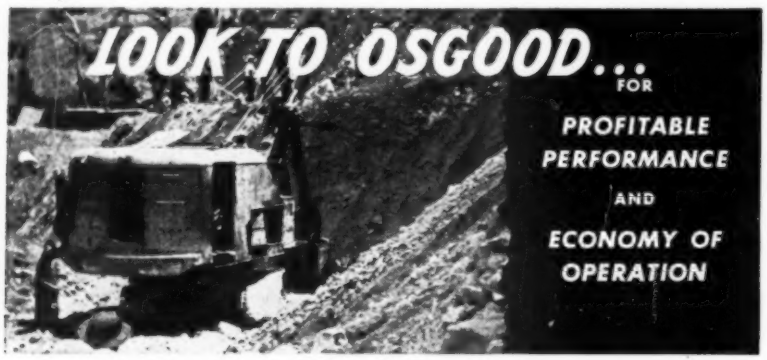
Court Holds Illinois Toll Road Law Lawful

Constitutionality of a 1943 Illinois law creating a State Superhighway Commission to build toll highways was upheld in an opinion handed down by the Illinois Supreme Court.

The ruling cleared the way for the commission to go ahead again with plans to build high-speed toll highways between Chicago and St. Louis, Chicago and Rockford, and East St. Louis to the Indiana state line.

The high state court reversed the Sangamon County Circuit Court, which had found the act invalid on the grounds it delegated "unlimited and arbitrary" power to the five commissioners.

The Supreme Court found that the Commission's powers to select routes and build highways was "ministerial"



OSGOOD 1½ yard shovel on Pan-American Highway near Tapachula, Mexico.

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⅜ cu. yd. to 2½ cu. yds.

Construction, excavating and material handling jobs can be handled economically and profitably IF the equipment you use has been designed for dependable, low-cost performance. Before selecting your equipment, check into design, materials and construction—these are the factors that count!

These are the factors featured by OSGOOD during "100 years of service" . . . a century in which OSGOOD pioneered numerous advancements in design and construction that have become standard for the industry. *Look to OSGOOD* for such cost-cutting features as: better cab visibility, fewer wearing parts, greater accessibility of machinery, larger diameter power-operated frictions, greater "payloads" due to less counterweight and a host of other features that pay off in profits.

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WITH ALLIS-CHALMERS DIESEL POWER

The experience of successful contractors and public construction officials has shown that it takes teamwork to get earth moving jobs done on time and at lowest cost. When your operators and equipment work together with you as a team, you have a really unbeatable combination.

In organizing such a team, a logical place to start is with your equipment. Gar Wood Road Machinery and Allis-Chalmers Diesel Tractors are already "teamed up" for high efficiency operation because they are engineered and built to work as a team. And this dependable, proved equipment wins the enthusiastic cooperation of operators because it gets jobs done with the least effort and the utmost convenience and speed.

You benefit too by the nation-wide service of the strong Allis-Chalmers and Gar Wood factory organizations through your local dealer—always helpful service that keeps your equipment going. Get this teamwork on your jobs. Order Gar Wood Road Machinery now from your Allis-Chalmers dealer.

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and not a delegation of legislative functions.

Under the statute the commission is empowered to issue revenue bonds for construction and operation of toll superhighways.

McMullen Heads SE Road Official Group

C. S. McMullen, chief engineer of the Virginia State Highway Commission, was elected president of the Southeastern Association of State Highway Officials at the concluding session of its annual two-day convention in Atlanta. He succeeds West Virginia Highway Commissioner Ernest L. Bailey.

George T. McDonald, engineer-director of the Georgia State Highway Department, was elected vice president, succeeding Alabama Highway Director G. R. Swift. It was announced the president would subsequently appoint a secretary-treasurer.

Highway Research Board Meets in Oklahoma City

The Twenty-fifth Annual Meeting of the Highway Research Board will be held from January 25 through January 28 in Oklahoma City at the Skirvin and Skirvin Tower Hotels.

The first day, January 25, will be devoted to department and committee meetings. On Saturday and Sunday, January 26 and 27 sessions of the Board and Departments will be held for the presentation and discussion of papers and reports relating to highway finance, economics, design, materials, construction, maintenance, traffic and soils investigations. On Monday, January 28, the departments of the Board will hold open sessions for the discussion of programs of needed research.

The Highway Research Board meeting will just precede that of the American Association of State Highway Officials which will also be held in Oklahoma City.

Plan To Start on New York Express Highway in 1946

Plans for the start of construction early in 1946 on New York State's long-projected motor "thruway," a $202,000,000 six-lane express highway from New York City to Albany to Buffalo to the Pennsylvania line, were disclosed recently by State Public Works Superintendent Charles H. Sells.

Sells said the first digging on the 486-mile project will begin in Ulster, Greene, Onondaga and Chautauqua counties, and that work in Ontario County might get under way at the same time.

With spurs to Connecticut, Massachusetts and Canada, the thruway system will be built to handle both commercial and passenger traffic at speeds up to 70 miles an hour, and is foreseen as the state's most important engineering project since the Erie Canal was opened 120 years ago.

Demonstrating the big project's economic importance is the fact that its terminal cities and a belt 30 miles each side of its route include 90 per cent of the state's population, 81 per cent of its cars and 86 per cent of its trucks and buses.

The thruway system, for which partial toll financing was suggested, will pass near or through the edge of most of the state's large cities. The whole project will be new construction. The surface will be of concrete, three lanes each way, with opposing traffic separated by a 20-foot safety mall in the middle. There will be no traffic lights, no cross traffic, no grade crossing. Each broad curve will have radius of at least 2,800 feet, and normal visibility ahead will be at least 1,000 feet at any point.

The main thruway is divided into four linking thruways, each separately named, and each of the three spurs is regarded as a separate project.

A brief description of the seven individual projects comprising the whole was given as follows:

1—Catskill Thruway—From Suffern, in Rockland County, northward through the Ramapo Valley along the west bank of the Hudson, through or near Harriman, Central Valley, Highland Mills, Woodbury Falls, Vails Gate, Newburgh,

(Continued on page 33)

Complete Dredges

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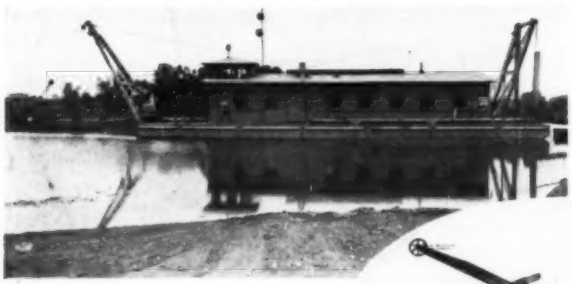
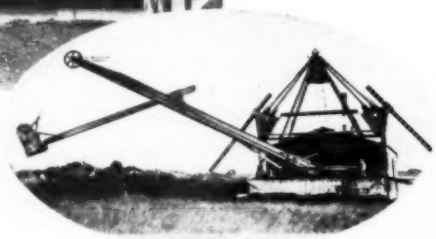


HYDRAULIC DREDGES
Sizes 8" to 15"



DIPPER and CLAMSHELL
¾ cu. yd. up

BOLTED SECTIONAL STEEL CONSTRUCTION

Every ASD dredge is designed as a complete, integrated unit for economical performance. Backed by 40 years of dredge building experience, these units are cutting yardage costs on many different projects—canals, harbors, channel improvements, drainage, sand, gravel, fills, ore recovery and other jobs.

Patented, bolted sectional steel hulls, all machinery and accessories are shipped by rail, truck or as hold cargo for assembly at site of use. May be dismantled, shipped and reassembled at remote inland locations.

Write for catalog, photos and data sheets.

Place your order NOW for early delivery.

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FORT WAYNE 1 • INDIANA • U.S.A.

Shock Absorber Construction!

● General licked the job of building a wartime tire that would do the same jobs done by pre-war tires. To do this, General developed a new type of tire construction.

"Shock-absorber" construction, it was named . . . because above all it reduced tire failures resulting from service damage. It *stops* shock concentrations . . . *distributes* heaviest service loads uniformly . . . *preserves* the carcass for more *original* service . . . more *recap* service . . . at lowest cost.

These big, rugged Generals . . . like all General Tires . . . are built to America's top-standard of Top-Quality . . . are the product of skilled craftsmen and advanced tire engineering. It's no wonder, then, that General Off-the-Road Tires as well as Highway Tires are delivering the lowest cost tire performance in your industry.

THE GENERAL TIRE & RUBBER CO. • AKRON, OHIO

TOURNAPULL contractor strips 40' overburden for MARQUETTE CEMENT CO.

General view of Earlham Quarry wh Tournapulls load overburden, haul a dump in mined-out pit area in ba ground. Note tough digging and slipp footing . . . loads are still heaped 100 to 125 feet.

BOOTH & OLSON, Inc. uses 5 Tournapulls to strip tough, wet clay on 500,000 cu. yd. job

6 to 8 feet of silt, 2 to 3 feet blue clay hardpan and 30 feet of slippery, wet yellow clay overburden makes stripping a tough job at the Marquette Cement Company limestone quarry, near Earlham, Iowa. Further, steep 20 to 30% haul road down the face of the limestone bank and long 6% return grade add to production problems. Stripping contractor, Booth & Olson, Inc., of Sioux City, Iowa, found Tournapulls to be the answer on this tough 500,000 cu. yd. job.

Tournapulls Average 9 Trips per hour each on 3000' Cycle

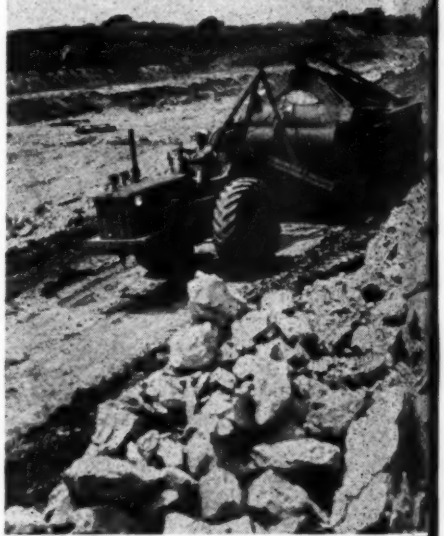
Working in slick, sticky clay, which tends to ball up, the Tournapulls are pusher loaded in 100 to 125 feet . . . average 9 trips of load, haul, spread and return every hour on 3,000-foot round trip haul. On the dump, LeTourneau positive ejection tailgate wipes the Carryall bowl clean . . . spreads the wet gummy clay in even layers. There are no stuck-in yards hauled back to the cut. Big rubber tires — plus powerful Tournapull 2-wheel design — give ample flotation and traction needed in the cut, on the spoil bank and to negotiate steep, slippery grades.

Tournapulls Drive in from Omaha

3 of these modern Scraper rigs were driven to the job under their own power from Omaha . . . made the 125-mile trip in 9 hours driving time . . . another time and money-saving advantage. Tournapull pit-to-pit moves over public highways with no extra shipping expense or waiting for flat cars or highway trailers, make it practical for stripping a series of pits located some distance apart.

Like Booth and Olson, you'll find that Tournapull s' ability to handle tough materials, their speed and mobility will give lowest-net-cost-per-yard on your stripping operations and for working sand, gravel, or clay pits. Get in touch with your LeTourneau distributor for detailed information TODAY. PQ7X

(Below) Tournapulls safely negotiate 20 30% grade on haul down to quarry flo



Positive LeTourneau ejection cle the Carryall bowl on the dump . . . spre wet material in even layers.

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PEORIA, ILLINOIS • STOCKTON, CALIFORNIA

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Over 4000 Built and Shipped

TOURNAPULLS

• Without modern excavating equipment the construction of the Gebel Aulia Dam, with which Egypt insures the flow of the Nile, is a long, laborious project. Eight thousand men worked on this dam which is 4½-miles long and was dug down 45 ft. to bed rock. The dam now forms a lake 250 miles long while it holds up the water of the White Nile until the Blue Nile, which joins the river downstream of the dam at Khartoum, has receded. The dam provides water for 3,000,000 acres of land and is part of Egypt's extensive irrigation scheme begun by Mohammed Ali 100 years ago. The projects include a dam at Lake Albert to hold 250 billion cubic meters of water. The completed projects, including the Dam of Assuan which will take about 50 years to complete, will double the agricultural area of Egypt to 13,000,000 acres.

Authenticated News Photo

Shots from the Firing Line

(Continued from page 30)

Kingston, Saugerties and Catskill. It ends where it cuts U. S. Route 20, west of Albany, near McKownsville.

Traffic from New York City will use the George Washington Bridge and pass through northeastern New Jersey to get on the Catskill Thruway at Suffern. New Jersey Routes 4 and 2, from the bridge to Suffern, four-lane arteries most of the way, are to be widened and made to conform to New York's thruway pattern.

When the Palisades Interstate Parkway is completed, drivers of passenger cars headed from New York City for the Catskill Thruway will have an option. They can take Routes 4 and 2. Or, they can take the parkway, follow the Hudson to the New Jersey-New York line, cut across Route 9W and enter the thruway near Highland Mills after passing through the Bear Mountain section of Palisades Interstate Park. Trucks headed for the thruway will be restricted to Routes 4 and 2.

2—Mohawk Thruway—From the end of the Catskill Thruway westward through the Mohawk Valley through or near Schenectady, Utica, Rome and Syracuse. It ends just north of the Village of Liverpool, in Onondaga County.

3—Ontario Thruway—From the end of the Mohawk Thruway westward past Rochester. It ends near the Village of Ebenezer in Erie County.

4—Erie Thruway—From the end of the Ontario Thruway southwest past Buffalo and along Lake Erie to the Pennsylvania line near Silver Creek in Chautauqua County.

5—New England Thruway — From the Bronx just north of Pelham Bay Park and northeast through Pelham, New Rochelle, Mamaroneck, Harrison, Rye and Port Chester to the Connecticut line.

6—Berkshire Thruway — From Albany southeast in the direction of Pittsfield, Mass., to the Massachusetts line.

7—Niagara Thruway—From Buffalo north to the Canadian border near Niagara Falls, Ont.

The sections on which construction will be started in 1946 will be along the Catskill Thruway between Catskill and Kingston; on the Mohawk and Erie Thruways at their junction point in Onondaga County, and on the Erie Thruway in Chautauqua near the Pennsylvania border. Digging also may be started in 1946 on the Ontario Thruway, in northern Ontario County near Victor.

Plan Huge Dam on India's Second River

An irrigation development twice as large as the Bureau of Reclamation's Columbia Basin Project and a dam almost as large as Grand Coulee Dam in Washington State will be constructed in India to help combat food shortages among her millions of inhabitants, N.

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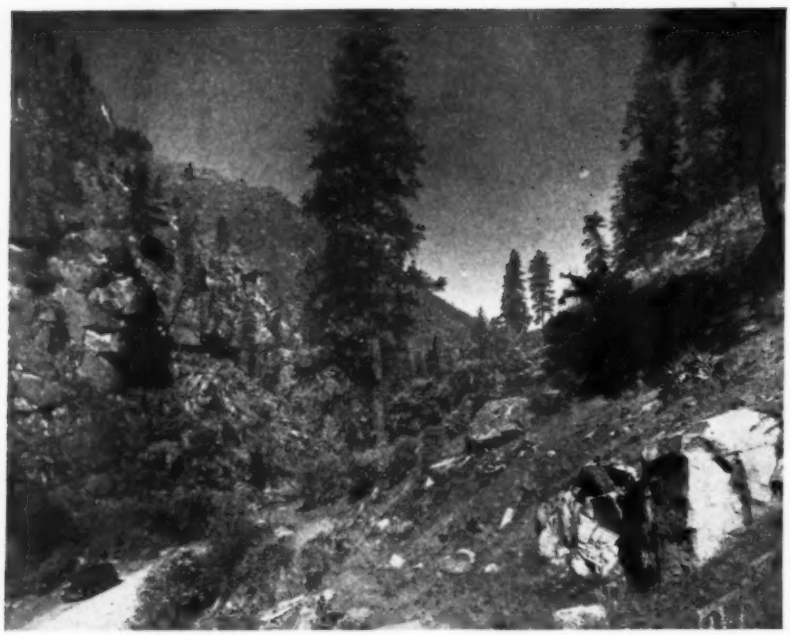

• This rugged setting on the South Fork of the Payette River, near Banks, Idaho, is the proposed site of a contemplated Bureau of Reclamation dam to impound 1,330,000 acre-feet of water for irrigating the initial 230,000 acres of the 400,000-acre Mountain Home Project, near Boise.
U. S. Bureau of Reclamation Photo

G. Ayyangar, Chief Engineer for Irrigation of the Government of Madras, India, declared.

Visiting Grand Coulee Dam to study some of the engineering techniques employed in building the world's largest concrete structure, Ayyangar said that the Madras project which he will supervise will require 10 years to build and will cost $200,000,000. He said that the dam in India will be a mile long and 400 feet high and will block the country's second largest stream, the Godavari, which he describes as being "four times as big as your Columbia River."

Dr. K. L. Rao, assistant to Ayyangar, asserted that the building of the dam will be particularly difficult because about 200 feet of muck and earth lie below the river bed and must be excavated for the foundation.

Start Work on New England Flood Control

A flood control program on 17 of 28 projects planned for New England by U. S. Army engineers is being started at an estimated total cost of $25,332,000. Work will begin on the remaining projects next spring. While under supervision of army engineers, most of the work will be done by private contractors.

Largest single project is the Bennington Reservoir in New Hampshire, costing $4,000,000. Other large projects include the West Peterboro, N. H. Reservoir, $1,394,000 and the Vermont Union Village Reservoir, $2,376,000. A reservoir at Holyoke, Mass. will cost $1,263,000 and one at Mansfield Hollow, Conn. $3,090,000. The Westville, Vt. Reservoir will cost $1,560,000 and the Barre Falls Reservoir $1,055,000.

New Hampshire Expenditures May Exceed Income

New Hampshire highway expenditures are likely to exceed income by the end of 1947, despite the availability for 1946 of an unprecedented total of funds, including a treasurer's balance of $2,876,000, it was predicted by department officials.

Although a total of $11,076,640, including current income, is expected to be available for use in 1946, it was estimated that total funds on hand will drop to $9,900,000 in 1947 and to $8,500,000 in 1948.

If indicated construction requirements are met, it was said, the highway department will continue in good financial position until 1947, at least. In that year the present treasurer's balance of $2,900,000 probably will be absorbed by costs and expenditures will exceed income by an estimated $374,000. At that time, it was predicted, the question of how to maintain and improve the highway system will constitute something of a problem.

New Hampshire highway revenue is now derived partly from a 4-cent-per-gallon gasoline tax. One cent of this tax is paid into the highway department sinking fund for retirement of bonds issued in the past for various

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Explanation of Picture—
Above is a Sauerman Crescent Scraper cutting deep into hill and hauling gravel to crusher. Bucket is pulled to rear of cut, gathers a heaping load, and carries load to hopper in a little over a minute; then dumps instantaneously into hopper. Simple and sure and cheap.

MANY excavating and stockpiling jobs require a machine that can haul as well as dig. On such jobs a Sauerman Crescent Scraper gives very economical results, moving large yardages over long hauls at costs of a few cents a cubic yard.

The secret of "Crescent" efficiency is in the streamline design of this unique bottomless bucket. A Crescent scraper penetrates hard materials with the ease of a plowshare, and requires less line-pull than any other type of scraper to move a given load.

Ranging rapidly over a large area, loading and dumping automatically, a Crescent Scraper, operated by a Sauerman improved hoist, is the most productive one-man machine for digging and hauling.

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purposes. On Dec. 31, 1944, it was explained, the total value of outstanding bonds of all denominations was $6,600,000, and unless added to, the bonds will all be retired by 1952.

Yield of the 3-cent gasoline tax reached a peak during the fiscal year 1941-42, when it amounted to $2,900,000, and dropped to a low point in 1943-44, when the total was only about $1,500,000. As a result of the end of gasoline rationing, income from the 3-cent levy is expected to climb to $1,800,000 during the present year. Estimates are that the revenue will increase by about 50 per cent in 1946 to about $2,700,000 and after a while will run about $3,000,000 a year unless a change in the rate is effected.

State income from motor vehicle registration decreased during the war years to a total of $2,270,000 in 1944, as contrasted with the previous high mark of $3,031,000. It is expected that the total from this source will reach $2,800,000 next year and average about $3,000,000 thereafter.

Federal aid to New Hampshire was approximately $400,000 this year.

• In loading sand and stripping overburden near Vassar, Mich., Great Lakes Foundry Sand Co. uses a Bucyrus-Erie ¾-cu. yd. dragline to cut through the center of hills. A railroad track is then laid through the cuts and the dragline loads six to ten carloads of sand from the surrounding area and then moves on to the next hill and the procedure is repeated.

Maine Wonders About Future Road Funds

Maine's State Highway Commission advised the State Legislative Research Committee that after its current surplus of about $5,000,000 had been used to match federal money to construct federal-aid highways in the next biennium, it was "not too clear where funds will come from for future road expenditures."

The commission estimated that income from motor vehicle registration fees and the gasoline tax would be about $10,200,000 by 1947, compared with $8,400,000 in 1945. At the same time, the research committee heard State Tax Assessor David H. Stevens predict that taxes received by the state from current sources for general fund use in the next six years would be somewhat less than at present.

Stevens mentioned several possible

(Continued on page 38)

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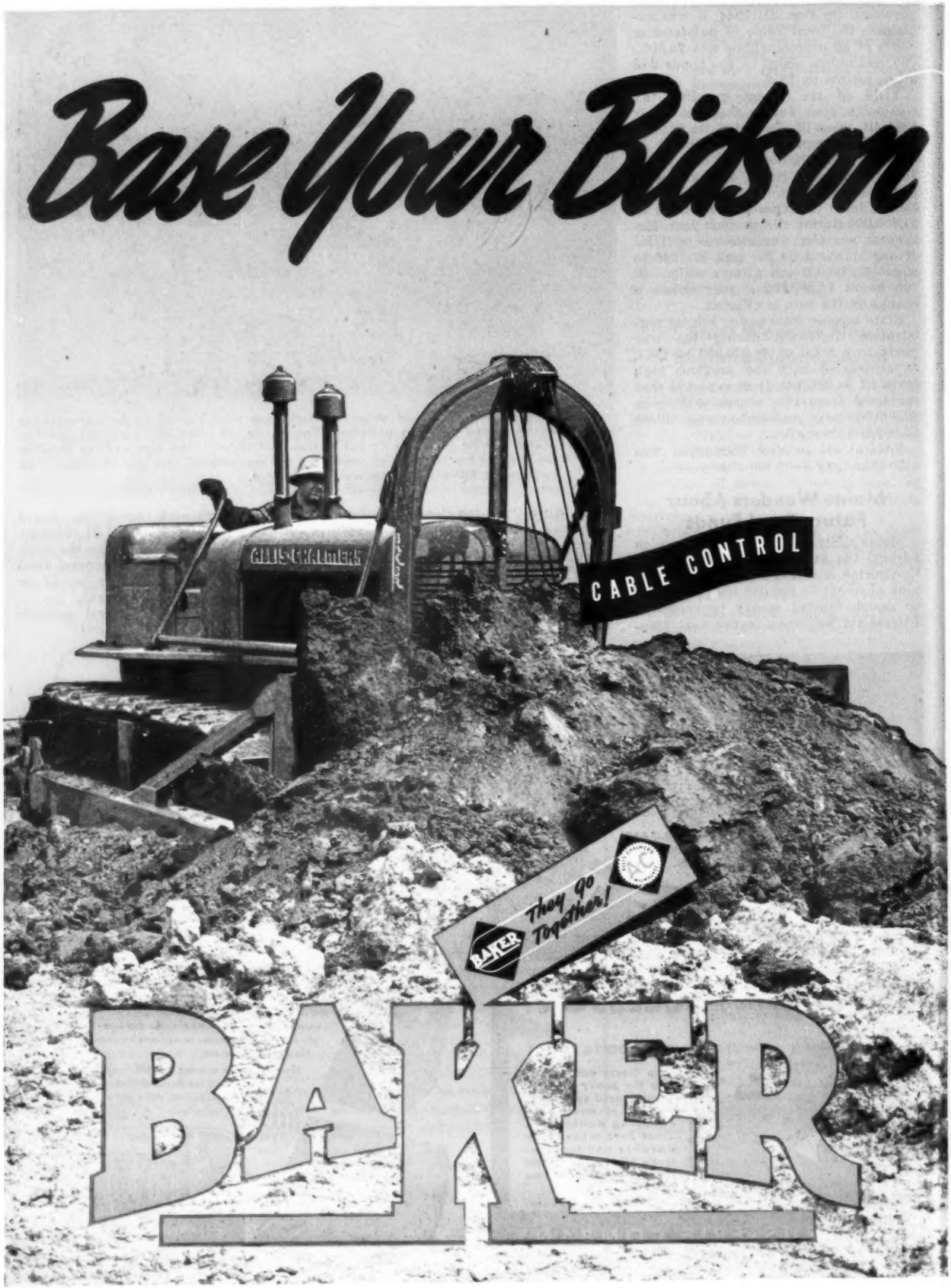
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Yes, successful bidders today, as before, know that when it comes to turning out yardage it's Baker every time. Hard hitting, powerful, dependable—teamed with Allis-Chalmers Diesel tractors, they set the pace on any job. Baker 'dozers are built exclusively for A-C tractors—cooperatively engineered, designed, tested and produced by two great leaders in their respective fields. That is why there is no compromise in design—no unbalanced performance—no adaptations required. That is why there are more Baker 'dozers on Allis-Chalmers tractors than all other makes combined

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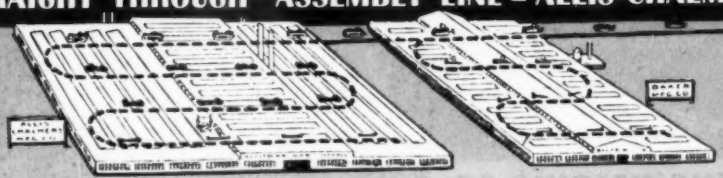

The modern Baker plant with its completely equipped fabricating, machining and blacksmithing shops adjoins the Allis-Chalmers crawler tractor plant. When you order an A-C tractor with Baker bulldozer or gradebuilder, your tractor leaves the A-C assembly line, crosses a narrow court and goes on the Baker final assembly line.

• The slot-dozing method here done by a LeTourneau Tiltdozer operator in cutting access road down a steep bank, increases yardages on many types of dozer work.

Shots from the Firing Line

(Continued from page 35)

new sources of state revenue, including a state sales tax and an income levy. The committee said it intended "to summarize and describe these taxes in our report to the Legislature."

New Jersey Future Depends On Road Development

With plans for a five-year $125,000,000 highway construction program in New Jersey, State Highway Commissioner Spencer Miller, Jr. asserted in his annual report that the state's future welfare and prosperity depends on how wisely and expeditiously a system of modern freeway and parkway development is carried out.

Warning that urban areas would suffer from blight and decay and recreational facilities would deteriorate unless the state applies bold remedies now, Miller said:

"The time has arrived to provide for the traffic demands of today, as well as those of the future. Very few existing streets and roads are capable of efficiently handling large volumes of traffic. Only through the application of freeway and parkway design can New Jersey overcome its highway transportation difficulties which are resulting in huge losses to motorists and industry, and great loss of life, time and property values."

He defined freeways and parkways as thoroughfares with no cross streets at grade, no traffic signals, with opposing streams of traffic separated and with "controlled access" at a limited number of entry and exit points. On freeways, commercial traffic has the right of complete use. Trucks and commercial vehicles are barred from parkways.

Miller, who has plans for combined state and federal highway construction in the state amounting to $25,000,000 a year for each of the next five years, said inadequate construction programs of the last decade had left a large number of important missing links in the state's highway system. That is especially true in the northern metropolitan area, he said.

Recalling that the state legislature in 1927 had enacted a comprehensive state

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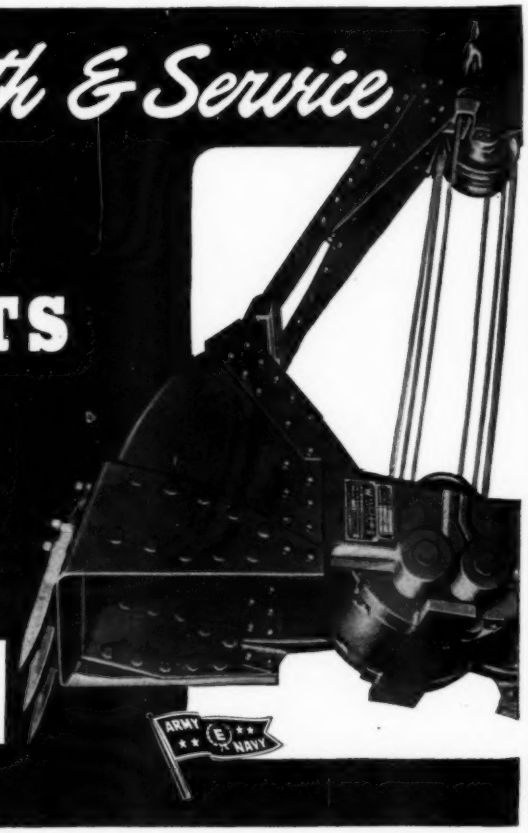

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High A-Frame folds up like this after two pins are removed.

Because **power raises and lowers the High A-Frame fast, you cut moving expenses every time you ship the new Koehring 30-ton crane by rail, every time you truck it through a highway underpass, every time you move it under overhead obstructions on the job. In just a few minutes you reduce overhead clearance from 18'-8" to 12'-9".**

REMOVE 2 PINS, THAT'S ALL

Raising or lowering the 605 High A-Frame is simple, safe. Remove 2 pins and the High A-Frame is ready for lowering by power. A cable attached to the hoist-drum controls lowering speed. The same cable raises the 605 High A-Frame back into position. No danger of over-pulling because the High A-Frame comes to a definite stop when fully raised.

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highway development plan, Miller said fulfillment of the plan was interrupted by the depression of the 1930s.

"The lack of vital transportation arteries thus anticipated by the legislature," he added, "compels large volumes of industrial, commercial, urban, intercity and recreational traffic to use existing streets and local roads. These already are inadequate for their own community needs. The result is an intolerable traffic congestion and strangulation of communication that are leading to deterioration and decay."

Unless remedies are applied, the state faces the prospect of losing great industries, Miller said.

Serious as is today's traffic congestion problem, he continued, it is overshadowed by conditions which the state will be called upon to face in the next 25 years. Commissioner Miller estimated that the present registration of 1,200,000 motor vehicles would increase by 400,000 by 1970. Within the same period, he said, traffic would more than double, increasing the present 12,000,000,000 vehicle miles annually to 25,000,000,000.

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Estimate 50% Increase in Construction Volume

Even in the face of present retarding factors, F. W. Dodge Corporation, fact-finding organization for the construction industry, estimates total dollar volume of new construction next year as 50 per cent greater than in 1945 in the thirty-seven states east of the Rocky Mountains. The estimate for all construction in the thirty-seven eastern states is $4,750,000,000 against $3,160,000,000 expected for 1945 on the basis of the record for the first ten months of this year.

Engineers Discuss Problems of Soil Compaction

Soil compaction in road building and airport construction was discussed by a representative group of 50 soils engineers in a two-day session in Washington under the auspices of the Soil Compaction committee of the American Road Builders' Association.

Earle F. Bennett, principal soils engineer of New York's state highway department, the chairman, chose G. W. McAlphin, Civil Aeronautics Administration; T. E. Shelburne, director of research for the Virginia state highway department; L. D. Hicks, assistant engineer of materials and testing, North Carolina state highway department, and J. D. Alrich of Seaman Motors, as discussion leaders.

OBITUARY

Lucien Merritt

Lucien Merritt, partner of the Merritt Dredging Company, died at a hospital in Charleston, S. C., on October 23 after several months of ill health. He was 67.

Mr. Merritt graduated from Hamline University in Minneapolis in 1899 and from the University of Minnesota with a degree in mining engineering in 1904. His father was a member of the family of Merritt brothers who discovered iron mines in Minnesota and he began his industrial career in mining.

About 35 years ago he began dredging work at Duluth on a project in Lake Superior. Later he spent 10 years dredging along the Mississippi River building levees for flood control. During the 1920s he did one of his outstanding jobs dredging in the fill for Davis Island at Tampa. Following his work in Florida he carried on extensive dredging operations along the east coast as far north as Albany and then came to Charleston 11 years ago.

Partners of Lucien Merritt in the Merritt Company were his brother, Harry Merritt; a son, Richard S. Merritt, and his nephew, Duane S. Merritt. Mr. Merritt was president of the Southeastern Dredge Owners Association and served on the board of directors of the National Association of River and Harbor Contractors.

Mr. Merritt was a member of Sigma Alpha Epsilon fraternity, Bethel Methodist Church, and the Charleston Chamber of Commerce.

He is survived by his widow, Mrs. Grace B. Merritt; a daughter, Mrs. Lucille Merritt Moore; his son and brother, all of Charleston, and a sister, Mrs. A. L. Merritt of Duluth.

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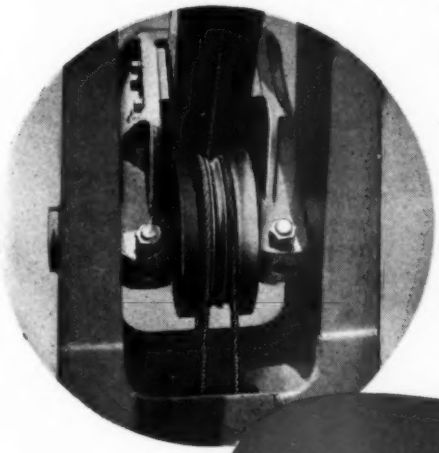

Balanced with hoist and swing to save vital seconds on every cycle, the Bucyrus-Erie rope crowd produces the kind of digging action that means more yardage. Whether the dipper is in close or extended to full reach and lift, whether it's empty or full, the operator has complete, positive control. Crowding and retracting are independent of all other functions, can be handled with regular rhythm for big output in shallow grading or in high speed loading — another factor in the outstanding performance record of ⅜-, ½-, and ¾-yard Bucyrus-Eries. And because the twin rope crowd eliminates many wearing parts, weight is kept down, maintenance reduced. Field conversion to crane-type front ends is easier, too, because the crowd drum is attached to the boom and comes off with it.

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Positive independent twin-rope crowd does a lot to make Bucyrus-Eries tops in output. But there are plenty of other reasons, too. The full Bucyrus-Erie performance story will convince you.

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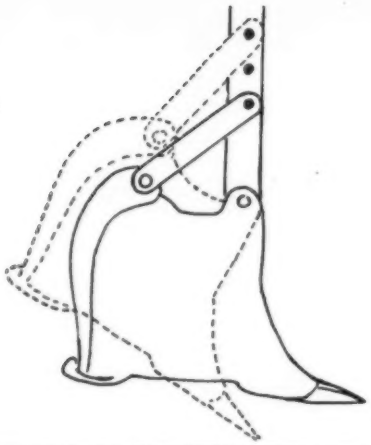

Shovel Practices

(Continued from page 13)

dipper is placed on the stick may be a very important item in the efficient and economical operation of the machine. Too often we see machines worn out which have never had the pitch braces moved from the original position in which they were set at the factory.

• Left: The angle at which the dipper is placed on the stick determines the efficiency of the operation of a shovel. Too often shovels never have the pitch braces moved from the original position in which they were set at the factory. (Illustration exaggerated to emphasize position of the dipper.)

Re-pointing Dipper Teeth

Many concerns make a business of re-pointing shovel dipper teeth when they become worn, but in many cases little thought is given to the width, length or thickness of the teeth after they have been re-pointed. The dimensions and shape of dipper teeth have a great deal to do with the digging qualities of a dipper. Either a new, unused tooth should be used as a pattern or a template should be made so that all pointing, sharpening, or building up by welding

Electricity

For Excavating and Contracting Work

Models range from 330 to 35,000 watts, A. C. types from 115 to 440 volts, 50, 60, 180 cycles, single or three-phase and 400, 800 and 806 cycles, single phase. D. C. types from 6 to 4000 volts. Also available in dual voltage and special frequency types.

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Onan Electric Generating Plants supply reliable, economical electrical service for excavating and contracting uses as well as for scores of other general applications.

Driven by Onan-built, 4-cycle gasoline engines, these power units are of single-unit, compact design and sturdy construction. Suitable for mobile, stationary or emergency service.

Model shown is from W2C series; 2000 to 3500 watts; powered by Onan-built, two cylinder, water-cooled engine.

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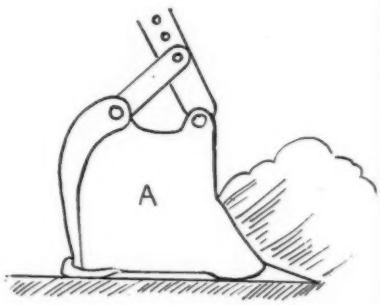
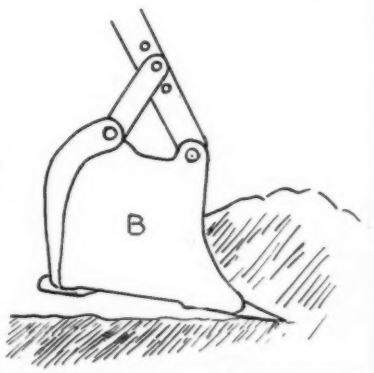
Write For Folder 690-A describing complete Onan Line





• Right: If a dipper is adjusted at an angle as shown in (A) the bottom will receive considerable wear. If the pitch is changed (B) so that the rear part of the dipper bottom is held up slightly, the dipper bottom travels through an area from which material has been removed by the teeth and lip.

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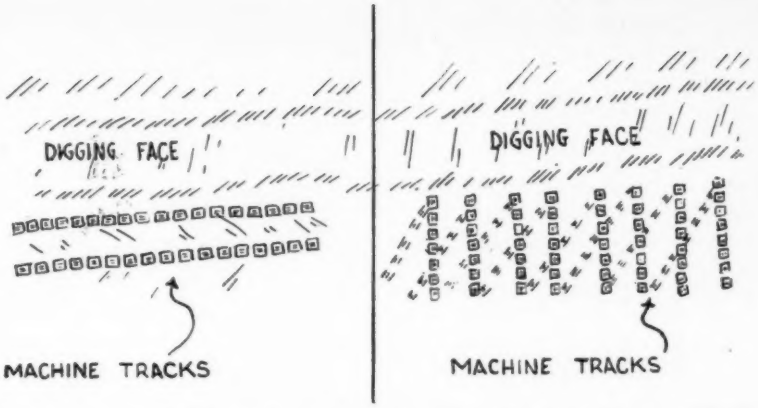
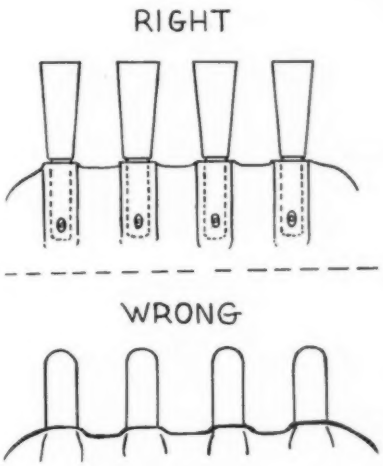


• Where a choice of procedure is possible it is unwise to work parallel to the digging face as illustrated in the first sketch at the right. It is wiser to head in to the cut as shown far right. The shovel can be backed out more quickly to avoid damage by slides.

brings the tooth back to its original dimensions.

Teeth should be kept wider at the sharp end than at the place where they join the cutting lip, otherwise material can wedge between the teeth. Teeth should fit tooth sockets firmly. Loose fitting shanks cause wear in tooth sockets. They may be shimmed by sheet iron shims, but care must be taken to see that the shimming places the teeth in correct alignment. Dipper teeth should be shimmed so that the shoulder of the tooth does not touch the bucket lip, thus all strain will be carried by the shank of the tooth



• Dipper teeth should be wide at points so material does not wedge between the teeth.

and tend to keep the tooth tightly wedged in the socket. If the shoulder of the tooth is allowed to carry the strains of digging there will be no opportunity for the tooth to wedge itself in the socket and there would be a tendency for the shank to move in the socket. Worn tooth sockets and worn tooth shanks are an abomination that should be avoided. The purpose of the shoulder on a tooth is to direct abrasive materials away from the dipper lip at the socket opening, not to carry the load of digging.

When the next-to-impossible Wire Rope job comes up . . . one that requires the utmost in strength and ENDURANCE, just call in "HERCULES" (Red Strand) . . . for here is a Wire Rope that through the years has proved its "extra" *endurance* every time it has been put to work.

Pioneering in heavy duty performance on tough wire rope jobs, "HERCULES" (Red Strand) has been adopted in one industry after another. That's why we say . . . for that *extra* endurance, flexibility, strength, elasticity and adaptability, always specify "HERCULES" (Red Strand), and you'll come in first with the job well done.

Made in Round Strand and Flattened Strand constructions . . . Preformed or Non-preformed —there's a type and construction to meet *any* heavy duty demand.

Consult our Engineering Department on *your* Wire Rope requirements—they'll be glad to

MADE ONLY BY
A. LESCHEN & SONS ROPE CO.
WIRE ROPE MAKERS — ESTABLISHED 1857
5909 KENNERLY AVENUE — ST. LOUIS 12, MISSOURI, U. S. A.

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PORTLAND 9 . . 914 N. W. 14th Avenue
SEATTLE 4 . . . 3410 First Avenue South

Tough Digging

(Continued from page 19)

crete is delivered to other than Hall jobs.

Before being placed on the Socony-Vacuum Oil Company road job Hall's Dozer-Shovel was used for digging basements, grading a highway near Valmeyer, Ill., where a flood had washed away an existing highway, and for grading on excavations done for the construction of new Chevrolet and Buick plants in the area.

In Business 36 Years

The H. H. Hall Construction Company has been in business for 36 years, during which time contracting work has been done in all sections of Illinois, Missouri, and Arkansas. Prior to the war, road contracting, chiefly structural road work such as bridge and grade separation construction, was Hall's principal business, but with the elimination of road construction jobs during the war period, the company turned to industrial contracting as its principal line of business. The company is incorporated for $75,000 and does an average of about $500,000 of business a year, including heavy hauling work, a transit mix concrete business, contracting, and machinery installation. The payroll varies with the amount of work being done with the number of employees varying on the average from 75 to 200 men.

• Prior to the war structural road work such as this viaduct over the M & O railroad tracks and a road near Columbia, Ill., was Hall's principal business.

Maintains Own Shop

The company has its own shop for equipment maintenance. The main shop is equipped with a ten-ton overhead crane that operates along a 30-ft. center section off of which there are about 15 bays equipped with narrow gauge tracks. Cars, or carriages, operated on these narrow-gauge rails are used to carry the equipment while in the shop for repairs. After the piece of equipment to be repaired is loaded to one of the cars by the crane the car is pushed back into its respective bay while work is being done on the equipment and in this way the center section of the shop is kept clear for bringing in more equipment or sending out repaired equipment.

In addition to the main shop there are a smaller truck repair shop and a welding shop, both equipped with overhead cranes to facilitate the handling of heavy parts.

Socony - Vacuum gasoline is used for all gasoline motors, Standard fuel oil is used for diesel equipment, and Socony - Vacuum lubricating oils and greases are used by the company. The company uses Leschen and Broderick & Bascom wire rope on its equipment.

• Concrete bucket on crane with goose-neck boom enabled the H. H. Hall Construction Co. to pour concrete for this overpass on a highway near East St. Louis.

The LOAD LUGGER Trade Mark Reg

Pays Off

IN EXTRA ECONOMIES

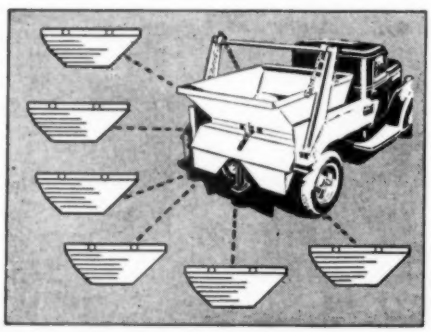
SPEEDIER . . .
Only 15 seconds for loading or dumping.

SIMPLER . . .
Hydraulic hoist. No shifting of load.

STURDIER . . .
Heavy construction and few parts. Low upkeep.

Write for Bulletin

Distributors in all Principal Cities



Here's the solution to your materials handling problem in 1946. Insures faster production at less cost. Saves time, reduces maintenance, conserves labor. Unit mounts on any chassis. Use 5 to 10 dump buckets per job.

301 Davenport Road, Knoxville 8, Tenn.

Brooks EQUIPMENT AND MFG. CO.

New trade literature

Title: **"Self-Priming Centrifugal Pumps"**

Subject: The principles of centrifugal action, physics of pumping, and evolution of self-priming centrifugal pumps have been explained in this highly illustrated treatise with its subject one of the most important pump developments of recent times. The 20 page handbook is basically scientific but its easy-to-understand style has covered a technical subject in an interesting manner. Differences in self-priming centrifugals, where they can best be used, and installation details also are covered in the work.

Where to Get: Marlow Pumps, Ridgewood, N. J. (Free)

Title: **"Carmet Methods Manual"**

Subject: Complete data on Carmet carbide tipped tools, including information on grades of Carmet available, terminology, grinding, chip breakers, coolants, brazing, hints on set-up and adaptation of standard tools to special uses, is given in the 20-page, 8½ x 11 inch Manual.

Where to Get: Allegheny Ludlum Steel Corporation, Brackenridge, Penn. (Free)

Title: **"Air-Operated Tools for Maintenance"**

Subject: The pocket-size folder, at a glance, informs the busy maintenance man the line of I-R air tools and portable compressors available for speeding up his work. Only representative models are pictured although ample information is given as to size ranges and model variations. Photographs illustrate air tools on construction, demolition and plant maintenance jobs and several new uses for well-known tools. Accessories to air-tool operation such as hose couplings, air line lubricators, steels and jackbits are also shown.

Where to Get: Ingersoll-Rand, 11 Broadway, New York 4, N. Y. (Free)

Title: **"Operating Power All Over the World"**

Subject: Specifications, prices, and photos of Katolight generators appear in this 12-page catalog. The units can be used in all construction activity where auxiliary electric plants are important.

Where to Get: Kato Engineering Company, Mankato, Minn. (Free)

Title: **"Procedure Handbook, Eighth Edition"**

Subject: Entirely revised to include the latest data on new arc welding methods and equipment, this 1,312-page book with 1,647 illustrations details most of the recent welding methods and techniques developed during the war. The volume is an excellent handbook to have handy, for it contains a wealth of new information and obsoletes much of the previous literature on welding. As the "Bible of the Arc Welding Industry", it carries data on welding symbols, speeds and costs, characteristics of metals, pre-heating, stress relieving, and sixteen new subjects.

Where to Get: Lincoln Electric Co., Cleveland, Ohio. ($1.50 postpaid in U. S.)

Title: **Highway Research Board**

Subject: Proceedings of the 24th Annual Meeting, 1944. Includes reports on following subjects: economics, finance, administration; materials and construction; maintenance, traffic and operations; soil investigations and special projects.

Where to Get: Highway Research Board, Washington 25, D. C.

Title: **Lessons in Arc Welding**

Subject: Series of lessons that form the basis of instruction in The Lincoln Arc Welding School based on the experiences of Arthur Madson, instructor. In the Lincoln School two types of courses are given—the basic course in fundamentals of arc welding and the advanced courses in alloy welding, sheet metal welding and pipe welding. The basic course is devoted entirely to the welding of mild steel in all positions and is concerned with Lessons 1 to 36, inclusive. The other lessons form the basis for the advanced courses.

Where to Get: The Lincoln Electric Company, 12818 Coit Rd., Cleveland, Ohio. (Price—50c in U.S.A. and 75c elsewhere)

Heavy Duty

Machinery Trailers

Full & Semi Models

5 to 75

Tons Capacity

LACROSSE TRAILER & EQUIPMENT CO.

Lacrosse **Wisconsin**

MEMO
Re: SNOW REMOVAL
Let's speed up and lower the cost of Snow-loading! Looks like HAISS snow buckets can do it.
J.A.D.
HAISS
SNOW BUCKETS

For catalogs, prices and deliveries, write or wire—

GEORGE HAISS MANUFACTURING CO., INC.. 144th St. & Park Ave., New York 51, N. Y.

NOT in the *Contract*

The customer pointed to the Chinese characters on his laundry ticket and asked the Chinaman, "Is that my name?"

"No name. Descliption. Means 'lil ol' man, closs eyes, no teet'."

Father: "Junior, would you like to hear a little story?"

Five-year-old Junior: "Sure, pop, but keep it clean; the old lady might hear you."

A romantic pair were in the throes of silence as the car rolled smoothly along an enchanting woodland path, when the lady broke the spell:

"John, dear," she asked softly, "can you drive with one hand?"

"Yes, my sweet," he cooed in ecstacy of anticipation.

"Then," said the lovely one, "you'd better wipe your nose, it's running."

"Was your husband in comfortable circumstances when he died?"

"No. He was half way under a train."

"Do you neck?"

"That's my business, sir!"

"Ah, at last — a professional."

The lady of the house was entertaining her bridge club when the pattering of tiny feet was heard on the stairs. She raised her hand for silence.

"Hush," she said softly, "the children are going to deliver their goodnight message. It always gives me such a feeling of reverence to hear them—listen!"

There was a moment of silence — then shyly, "Mama, Willie found a bedbug."

And then there was the strip tease lassie who woke up one morning after a raid and found herself fully clothed. "Ye gods," she screamed, "I've been draped."

A man of six feet eight inches applied for a job as a life guard.

"Can you swim?" asked the official.

"No, but I can wade to beat the devil."

"Gee, Dad, this dragline really works!"

Two friends were motoring home from a fishing trip to Maine when they encountered engine trouble on a lonely road at dusk.

Of course, they knocked at the door of a farm house down the road and the farmer's beautiful daughter answered their knock.

She gave them dinner and let them stay over night. Six months later one of the friends received an ominous looking legal document. A frown disappeared as he read it, and then he phoned his fishing companion: "I say, Tom," he said, "did you by any chance spend a little time with that beautiful farm girl the night our car broke down?"

"Why—ah—yes," answered Tom, sheepishly.

"And did you, in a moment of Machiavellian cunning give her my name and address?"

"Now don't get sore about that," broke in Tom. "Where's your sense of humor?"

"Oh, I'm not a bit sore," his friend assured him. "I just thought you'd like to know I've heard from her lawyer. She died last week and left me the farm and $12,000 in cash."

"Consomme bouillon, hors d' oeuvres, fricassee polet, pommes de terre au gratin, demitasse des glaces, and tell that mug in the corner to keep his lamps offa me moll, see!"

Contractor (on telephone): "Hello, what are you doing?"

Woman's voice: "Getting ready for church."

Contractor: "Sorry. Wrong number."

A Scotch farmer back from the country fair with a new horse found the animal refused to eat or drink. The farmer's eyes gleamed hopefully: "By golly, I've got a real bargain if he's a good worker."

A banker is a man who will loan you money if you prove to him that you don't need it.

A young lady received a brassiere as a birthday present. Said she mournfully: "I wish he'd sent the money instead. I'm flat busted."

Customer: "Have you a book called 'Man, the Master of Women'?"

Clerk: "Fiction department on the other side, sir."

Notes from the manufacturers

The **Blaw-Knox Company**, Pittsburgh, Pa., announced the appointment of Arthur A. Levison as vice-president of the Blaw-Knox Division in charge of the construction equipment department.

Western Contractors Supply Co., Chicago, has been named distributor for Chain Belt Company of Milwaukee.

Gar Wood Industries, Inc., Detroit, announces that W. H. Hammond has been promoted to the newly created post of vice-president in charge of sales.

Furnival Machinery Co. is the new name of Furnival-Rimmer Co. of Philadelphia, Pa. The change in the firm name was recently announced.

International Harvester Company, Chicago, will use the former Buick aviation engine plant at Melrose Park, Ill., for expanded production of its industrial power line of products. The greater portion of the plant's 1,200,000 sq. ft. of manufacturing floor space will be used for the production of Diesel motors to power Harvester's line of crawler tractors. Other motors will be sold to equipment manufacturers who use Harvester motors to power their machines. The plant will be known as the Melrose Park Works of the International Harvester Company.

In addition to the line of Diesel motors, one 65 h.p. gasoline engine, one large new model of crawler tractor—the TD-24—and a full line of stationary power units will be made in the plant. It is possible the company may also use parts of the plant for other purposes.

Diesel engines built at the plant will range in size from 35 h.p. to 200 h.p. The large new crawler tractor to be built at the plant will be the largest tractor of any type built by Harvester. It will weigh 18 tons and have 130 h.p. at the drawbar.

Smith Booth Usher Company, Los Angeles, announces the appointment of Alex Kostyzak as general manager of the construction equipment division of the firm. Mr. Kostyzak, a native of Pennsylvania, has been sales engineer of Smith Booth Usher Company since 1936. Previous to his association with Smith Booth Usher Company he spent 15 years in various capacities on construction projects with such eastern contractors as Hunkin-Conkey Construction Co., Geo. A. Fuller Company, T. A. Gillespie Company, General Contracting Corporation, The Koppers Company, and others.

Diesel Engine Manufacturers Association elected as president E. J. Schwanhausser, vice-president of Worthington Pump and Machinery Corporation.

Worthington Pump and Machinery Corp.'s construction equipment division has added Floyd S. Adams of Ada, Okla., to the sales staff to cover Texas and Oklahoma.

American Steel Dredge Company, Fort Wayne, Ind., announces that Walter W. Walb has been elected president to succeed his father, the late Clyde A. Walb, who died Oct. 30. He will also continue to serve as general manager of the company.

Hercules Powder Company, Wilmington, Delaware, announces that C. C. Gerow, first director of sales, will retire Dec. 31, 1945, after more than 47 years in the explosives industry. He was one of the first three men employed by Hercules when the company was formed in October, 1912. His successor, Leroy Keane, was appointed director of explosives sales October 1.

Fairbanks, Morse & Co., Pomona, Calif., has appointed the Milwaukee Machinery Co. of Portland, Ore., exclusive distributor for the complete line of Fairbanks-Morse Turbine Pumps. Their pump department will be headed by W. H. Perry, formerly with the Dallas Branch of Fairbanks, Morse & Co.

Davey Compressor Company, Kent, Ohio, has named Floyd Jones eastern sales manager with headquarters in New York City.

Allis-Chalmers Manufacturing Company, Milwaukee 1, Wisconsin, has appointed Charles N. Karr as sales promotion manager of the tractor division. He succeeds E. L. Aikins who was recently placed in charge of the company's tractor division Seattle, Washington office.

Timken Roller Bearing Company, Canton 6, Ohio, announces that Fred Reiser, Jr., Cincinnati district manager for the Industrial division of the company since 1944, has been named division manager for all divisions there effective December 1.

BUDA JACKS

for Every Lifting JOB

Buda Model 2215 "All Purpose" Automatic Lowering Rachet Jack 15 ton Capacity

Over 170 Models in Production

Capacity from 1 to 100 tons

Write for Full Information

THE BUDA COMPANY
15410 Commercial Avenue
HARVEY, ILLINOIS
(Chicago Suburb)

ROGERS *GIRDER TYPE*

the BETTER trailer for your BIGGER hauling jobs

THIS trailer, designed by Rogers Brothers to meet low headroom conditions, has been used for some time in certain sections of the country. Now, because of the larger equipment in use, it is coming into extensive use elsewhere.

ROGERS BROTHERS CORP. **ALBION, PENNA.**

EXPERIENCE *builds 'em* — PERFORMANCE *sells 'em*

TO ADVERTISE: All advertising in this section is payable in advance. Rate: 60c per line, or $7.20 per inch of 12 lines. Minimum charge $2.40. No discounts; no commissions. If no change in copy is desired, three continuous insertions are offered for the price of two. Read these instructions carefully. Each line contains 41 characters (34 characters if all capital letters are used). Count spaces and punctuation as one character each. Allow 10 characters for box number, if blind advertisement is desired. Count your own copy to save delay. Be sure to enclose the correct amount of money with your order. Closing date—15th of preceding month. Example: January issue closes December 15th.

TO INQUIRE: Be sure to address your inquiry to the advertiser by using the correct box number. Mail your letter in care of Excavating Engineer, South Milwaukee, Wisconsin. Write each advertiser a separate letter. Do not write us for name and address of advertiser. This information will not be given out. We have no information about the equipment advertised other than that shown in the advertisements themselves.

LARGE SHOVELS, CRANES AND DRAGLINES
2½ YDS. AND UP

350 Marion electric shovel. Serial No. 4607. Has been used in stripping work near Hibbing, Minnesota.

Pickands Mather & Company
700 Sellwood Building
Duluth 2, Minnesota

SMALL SHOVELS, CRANES AND DRAGLINES
UP TO 2½ YDS.

Marion ¾-yd. Shovel — Clam — Dragline. New guarantee.
Northwest 1¼-yd. shovel, dragline. Rebuilt.
Diesel 3-yd. dragline, 115' boom. Excellent condition. Box 3135

1—Lorain 75-B gasoline shovel in excellent condition. Located Virginia.
1—Bucyrus-Erie 37-B, 11,000 series, gasoline shovel, completely reconditioned except caterpillars. Located West Virginia.

Bemiss Equipment Corporation
2219 Chamberlayne Avenue
Richmond, Virginia

MISCELLANEOUS EQUIPT.

One 1½ yd. Blaw-Knox Clamshell Bucket
One 1¼ yd. Blaw-Knox Clamshell Bucket
One 1 yd. Blaw-Knox Clamshell Bucket
One 1 yd. Keisler Clamshell Bucket
One ¾ yd. Williams Clamshell Bucket
One 1 yd. Bay City Dragline Bucket
One 1½ yd. Model RC-Page Dragline Bucket
One 1½ yd. Bucyrus-Erie Shovel Front, Chain Crowd, with 1½ yd. Amsco dipper.
Two Bucyrus-Erie Double Drum Power Winches for D8 or similar size tractor.
Box 3134

One Bay City tractor shovel, fair condition, back hoe attachment, $1,750.
One Barber-Greene bucket loader, Model 82-A., Excellent condition, $3,500.

Britt & Britt Milling Company,
Miami, Oklahoma, Box 758

One Bucyrus 31-B high lift steam shovel, Serial Number 4797. One Williams patent crusher and one No. 5 Jr. Jumbo crusher. One traveling apron, heavy-duty feeder, for above hammer mill. Box 3130

Clamshell and Dragline Buckets New and Used — We Have the Bucket For Your Job.

Phone — Wire — Write
THE BUCKET MART
1150 North Branch Street
Chicago 22, Illinois
Phone Michigan 1515

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1 yd. Page dragline bucket
2½ yd. Williams Type DX dragline bucket
2 Climax ore or rock jaw crushers
Limestone or ore grinder
Jaeger 2" Centrifugal pump. Motor, Wisc. 1 cyl. unit mounted on one rubber tired barrow wheel
Bucyrus-Erie 33-B shovel front (with or without dipper)
Koehring 701 Shovel, front (with or without dipper)
Lorain 25' center section crane boom and 15' jib section with jib accessories
Palmer Bee speed reducer, Serial No. 244, Ratio 56 to 1

THE HECKETT CORPORATION
120 West Pearl Street
Butler, Pennsylvania

Welding and Cutting Outfits, Torches, Regulators and Gauges, for heavy, medium, and light welding and cutting.

Superior Oxy-Acetylene Co.,
Hamilton, Ohio

Bucyrus-Erie 54-B chain crowd shovel front end equipment. New, has never been used. Consists of 2½-yd. dipper, 26' boom, 18' handle, complete with all necessary parts. Box 9256

For Sale—

SHASTA DAM SAND AND GRAVEL PLANT EQUIPMENT

Including—
GOODYEAR 36" SPECIAL-MAKE BELTING FROM 10-MILE CONVEYOR
16,000' of Belt Remaining
With Idlers, Pulleys and Drives

ALSO—
Electric Motors, Line Equipment, Transformers and Supplies
Pendulum Boom 42" Belt Conveyors, 100' and 200'
Merrick Feedoweights and Weightometers
Dorr Hydroseparator, 20' x 4'
Marcy Rod Mill, 8' x 12'
Vibrating Screens
Trestle and Tripper
Dorr Rake and Bowl Classifiers
Gravel Washer: Extra-heavy Blade Mill
Pumps: Centrifugal, Deep-well, Steam, Dredge
Auxiliary Equipment: Chain Hoists, Winches, Welding Machines, etc.

Subject to Prior Sale
Write, Wire, Telephone Redding 1440

COLUMBIA CONSTRUCTION CO., Inc.
Box 579 Redding, California

SURPLUS DIPPERS FOR BUCYRUS-ERIE SHOVELS

2—⅝ cu. yd. Skimmer Scoop Dipper—10-B.
2—¼ cu. yd. Drag Shovel Dipper—17-B.
3—½ cu. yd. Skimmer Scoop Dipper—17-B.
1—¾ cu. yd. Welded Dipper—21-B.
1—1¼ cu. yd. Drag Shovel Dipper—33-B.
1—1½ cu. yd. Heavy Duty All Cast Dipper—42-B.
1—1½ cu. yd. type 4 Med. Duty Dipper.
1—2 cu. yd. Rock Dipper—75-B.
1—2¼ cu. yd. Inserted Type Dipper—50-B.
1—2¼ cu. yd. Inserted Type—55-B.
1—2½ cu. yd. All Cast Dipper—55-B.
1—3½ cu. yd. Coal Loading Dipper—75-B.
1—4 cu. yd. Type IV Medium Duty Dipper—100-B.

F.O.B. Works

Write for any further information desired.

BUCYRUS-ERIE COMPANY
Parts Department
South Milwaukee Wisconsin

FOR SALE
Dragline Bucket
1—3-cu. yd. Type AY Heavy Duty Bucyrus-Erie Dragline Bucket
Box 626 Emporia, Kansas

Wagon Drill: Ingersoll-Rand, Model B, complete with hoist, X71 Drifter and Air Receiver. Good condition. $750 f.o.b. Mankato, Minnesota.

McCree & Company
918 New York Bldg. St. Paul 1, Minn.

One complete set of Bucyrus-Erie 20-B tracks, with drive chains, tumblers, rollers, and side frames for use under crane or shovel; condition—fair; price—$500 (New price approx. $2000). These parts are located at Coldwater, Michigan. Box 3132

1—Link-Belt, 25-ton steam locomotive crane, 3 wheels, equipped with 50' boom, outriggers and double drums for clamshell work, air brakes, new flues in boiler, and in A-1 condition, located Norfolk, Virginia.

Bemiss Equipment Corporation
2219 Chamberlayne Avenue
Richmond, Virginia

MECHANICS step up your own skill with the facts and figures of your trade. Audels Mechanics Guides contain Practical Inside Trade Information in a handy form. Fully Illustrated and Easy to Understand. Highly Endorsed. Check the book you want for 7 days' Free Examination. Send No Money. Nothing to pay postman. ( ) Marine $4, ( ) Blueprint $2, ( ) Machinist $4, ( ) Electricity $4, ( ) Shipfitter $1, ( ) Welders $1, ( ) Radio $4, ( ) Plumbers $6, ( ) Diesel $1, ( ) Carpenters $6, ( ) Mathematics $2, ( ) Auto $4, ( ) Sheet Metal $1. If satisfied you pay only $1 a month until purchase price is paid. AUDEL, Publishers, 49 West 23rd St., New York 10, N. Y.

WANTED

4 or 5 yd. Electric Quarry Shovel. Box 3136

HELP WANTED

Design Engineers. Fully experienced in the primary design of heavy construction machinery, such as, shovels, bulldozers, carry scrapers, road rollers, motor graders, asphalt mixers, crushing plant, tractor winches and hydraulic control equipment; wanted for leading South African machinery manufacturing concern. State fullest details, present salary, past experience, age and whether married. Give references. Permanent position with future. Box 9257

POSITIONS WANTED

Can operate any kind of shovel, dragline, crane or clamshell—steam, diesel, gas or electric. Can do own repair work. Experienced in quarry, ore and coal stripping. Prefer quarry or coal stripping. Familiar with grading work. Will go anywhere. Have release. Box 9254

Graduate civil engineer with 30 years' experience in general, civil and construction engineering: past 20 years for U. S. government. Now commissioned reserve office doing administrative work for past 10 years covering all types of C. E., construction engineering. Age 51, married. Seeking a permanent connection in 6 months to a year. Box 9255

Crane operator—with 1½-yrs. experience in military service with gas powered cranes, draglines and shovels. Hard worker willing to learn. Age 24. Available for work within 250 mile radius of Philadelphia or Chicago. Box 9258

AMERICAN CABLE SLINGS

are ACCO Registered

American Cable proof-tests every Registered sling to twice its safe-working load, before it leaves the mill. You then receive a Certificate of Test and Registry for known, predetermined strength and safety. Every sling, so registered, is identified by a metal registry tag which states maximum safe load, date of testing, and registration number. This is the biggest advance ever made toward proper wire rope sling application and working safety. Specify American Cable's ACCO-Registered slings—made of TRU-LAY Preformed Wire Rope of Improved Plow Steel.

ACCO

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AMERICAN CABLE DIVISION
AMERICAN CHAIN & CABLE

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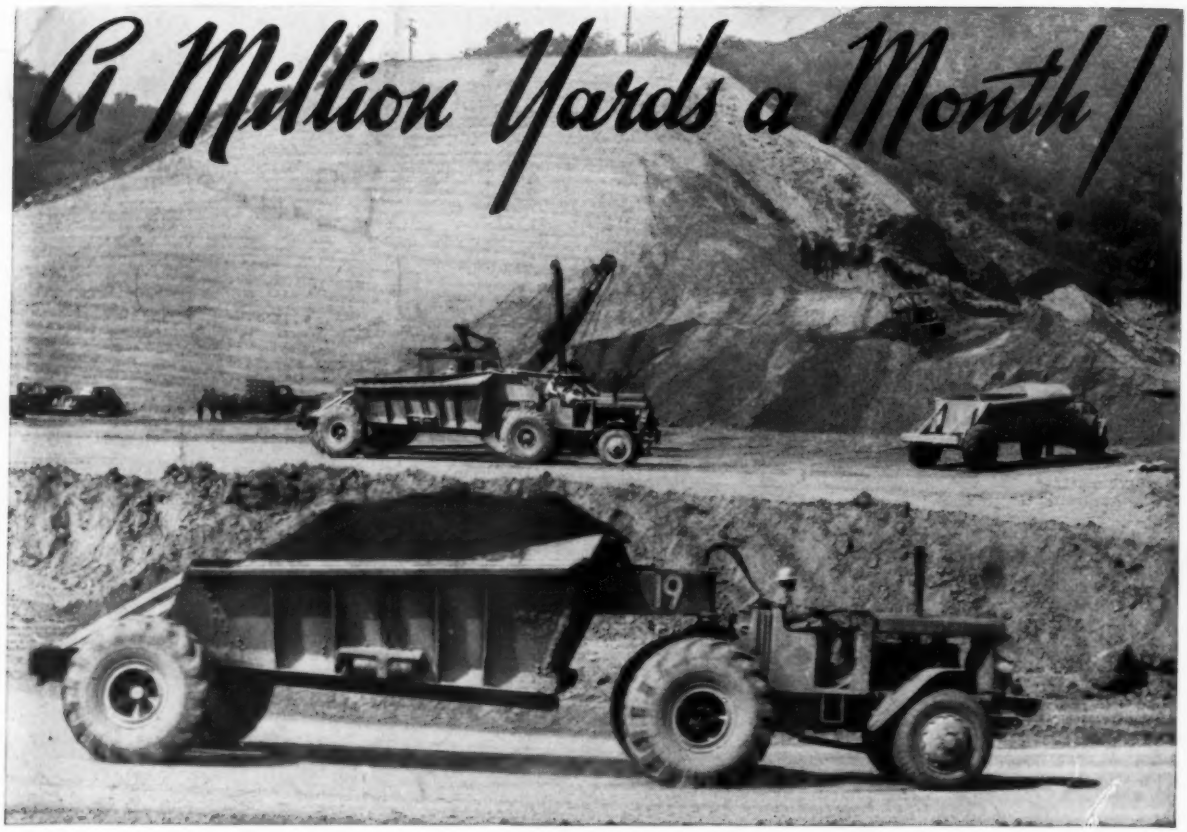

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● The construction of Santa Fe Dam — a tremendous earth fill flood control project on the San Gabriel River near Azusa, California — required the hauling of 14,000,000 cu. yds. of material. Four large western contractors* combined their forces and equipment on this job.

Approximately 6,000,000 cu. yds. were hauled in 22 Euclids on hauls varying from 1500 ft. to 4.5 miles. They moved about 1,500,000 yards of core material over the longest haul, and the balance — consisting of sand, gravel and boulders — was hauled an average of 4,000 feet.

During peak operations a million yards were moved in a single month. Euclid speed, capacity and dependability of performance helped to make this record possible.

Euclids are built for tough, off-the-highway service — to move earth economically. See your distributor for facts and figures on what Euclids will do for you — or write us direct.

*Morrison-Knudsen Co., Winston Bros. Co., J. F. Shea Co. and Ford J. Twaits Co.

Outstanding Euclid Features

Exclusive Euclid all-enclosed double-reduction full-floating planetary type drive axle . . . unequaled for years of trouble-free performance on the toughest jobs.

Euclid wedge-shaped hopper which distributes more of the payload weight to drive wheels for better traction . . . rigidly welded, riveted and bolted construction.

Internal expanding air brakes, 17¼"x5½" brake shoes . . . individual steering brakes on drive wheels for better steering and traction control. Sturdy three-way universal hitch permits maximum maneuverability. Euclid wheel wind . . . simple air controlled mechanical device for closing doors, tested by years of trouble-free service. Doors opened instantly by control valve on steering column . . . closed in a few seconds on the return trip.

The EUCLID ROAD MACHINERY Co., CLEVELAND 17, OHIO

EUCLID SELF-POWERED HAULING EQUIPMENT For EARTH . . ROCK . . COAL . . ORE

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